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THE COLOR COMPUTER MONTHLY MAGAZINE

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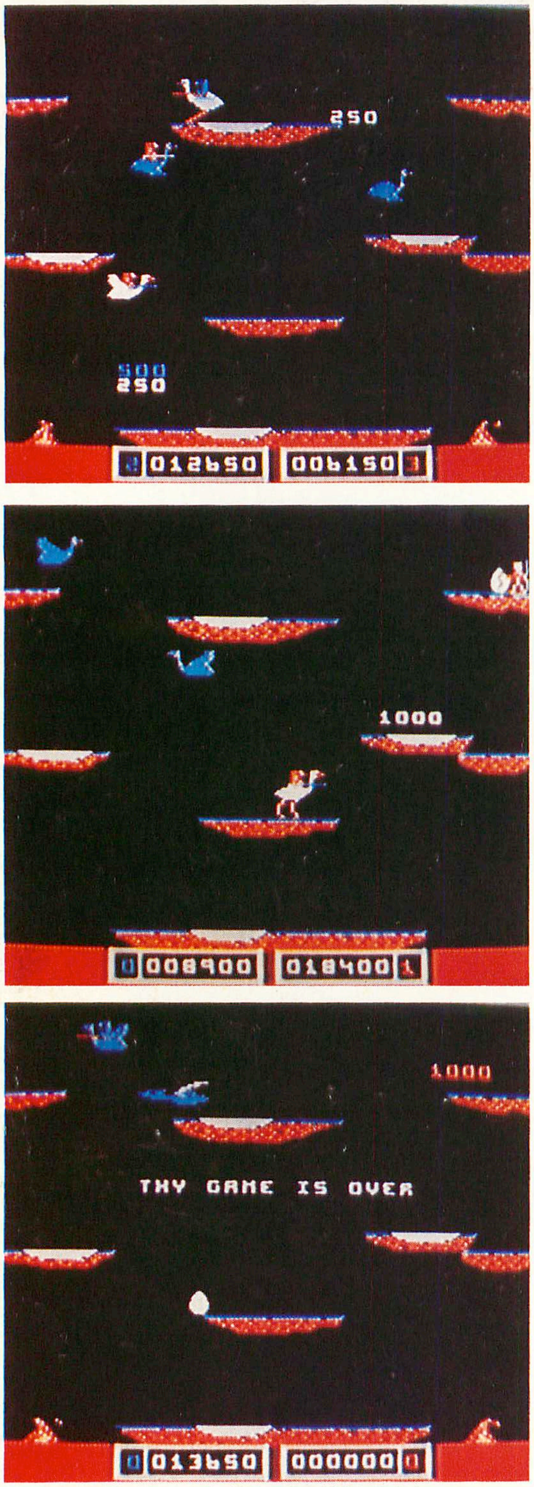
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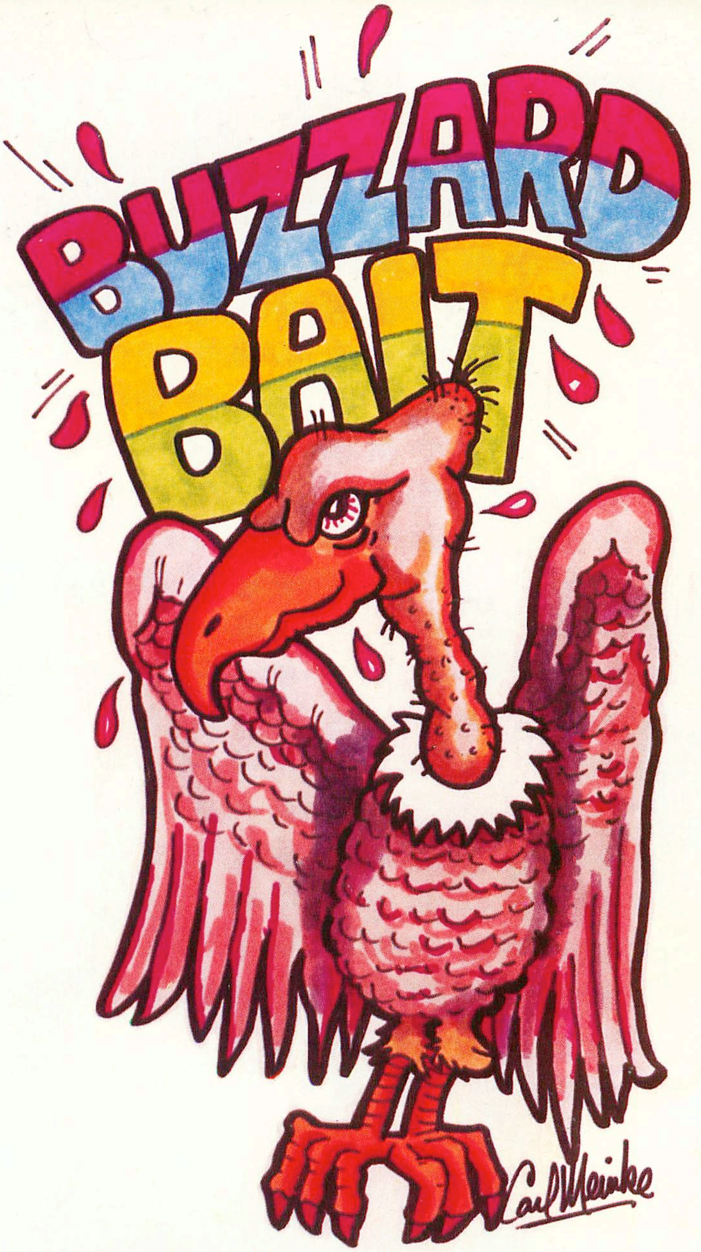
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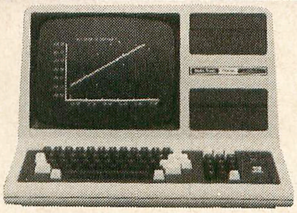

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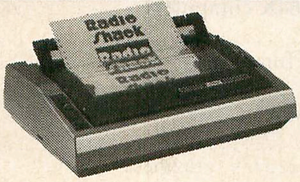

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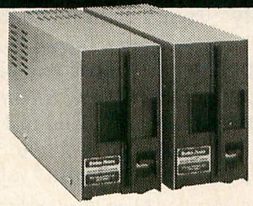

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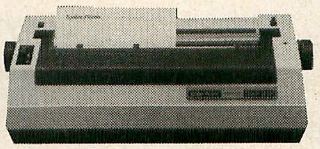

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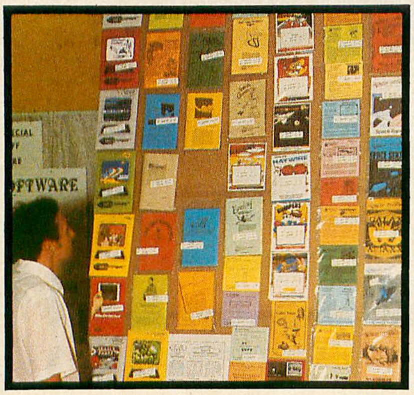
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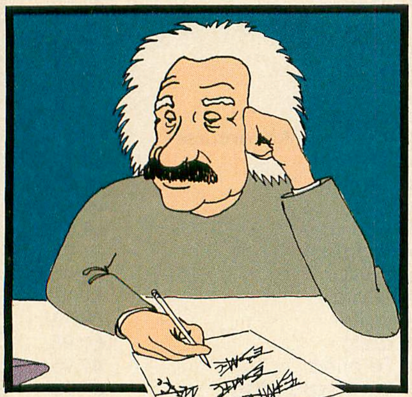
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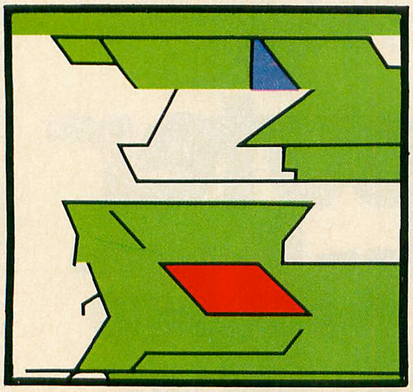
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NEXT MONTH: February is our Adventures issue, the kickoff of our Adventure game contest. We'll announce the rules and deadlines and offer some expert advice to get you started. In addition to three new columns we'll be adding in February, we are also starting a new technical section of the magazine complete with a regular feature to answer your technical questions.

As always, we'll have a full mix of CoCo games, home help programs, utilities and tutorials, dozens and dozens of new product announcements and more than 30 hardware and software reviews.

Look for the February *Rainbow* for more on the Color Computer than is available from any other source.

The RAINBOW

January 1984 Vol. III No. 6

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The RAINBOW is published every month of the year by FALSOFT, INC., 9529 U.S. Highway 42, P.O. Box 209, Prospect, KY, 40059. Phone (502) 228-4492. **The RAINBOW**and **The RAINBOW** logotypes are ® Trademarks of FALSOFT, Inc.

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Subscriptions to **The RAINBOW** are $22 per year ($28 after Jan. 1, 1984) in the United States. Canadian and Mexican rates are U.S. $29 ($35 after Jan. 1, 1984). Surface mail to other countries is U.S. $57 ($65 after Jan. 1, 1984), air mail U.S. $85 ($100 after Jan. 1, 1984). All subscriptions begin with the next available issue.

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letters to RAINBOW

SWEET PRAISE

Editor:

I can't tell you how much I look forward to *the Rainbow*. I'm like a kid in a candy shop. You writers have a real flair for being concise. Top notch! All that praise, and for a magazine that doesn't even have a centerfold. Keep up the good work!

Robert A. Walker
Crewe, VA

Editor's Note:

Check our January 1983 issue. It *does* have a foldout!

HELPFUL HINTS

Editor:

I have seen requests for locating the 5-pin joystick plugs for the CoCo. They are available with the cable attached as part number AW-2894. I paid $1.62 for the plug with cable in July 1983.

The 4-pin plugs for serial I/O should also be available via the same route, but I don't have a part number for them. Just ask for a replacement connector for the 26-3020 cable, or buy the 26-3020 cable which has two of the 4-pin connectors on it.

I have been a CoCo "nut" since June of this year, and have found *the Rainbow* to be the best buy in CoCo magazines (I'm a subscriber, but the newsstand price isn't bad for the amount of info you get in each issue).

John E. Carter
Smyrna, GA

RECIPES FOR COLD POKE

Editor:

In your November 1983 issue, you printed the cold poke, *POKE 113,0:EXEC 40999*, and asked for any handy uses for this poke.

What I use this poke for is to cold start the CoCo when using my disk drive, without having to extract the disk. Since the restart is done from software and not hardware, there is no flashing the head of the disk resulting in crashed disks.

Also, for what it's worth, if you *EXEC 40999* without the poke, you can get a reset.

I use the cold start poke in a small program that includes the unload command followed by the poke.

David E. Fultz, Jr.
Marion, OH

Editor:

In the November issue, you requested a reply from those who use the *POKE 113,0: EXEC 40999*. I use this poke quite often but with a slight modification, that is *POKE 113,3: EXEC 40999*. What this poke does is to reinitilaize the computer to its normal condition as when you first put it ON. It does this without shutting it down.

Each time I have entered and executed a ML routine, be it a small utility, a game or whatever, I always use this poke before loading in another ML routine.

If, by mistake, I have the computer bugging, and it seems to be okay after having pushed the [RESET] button, I always do this poke to make sure that the computer is in normal working condition again. I like your magazine a lot.

Alain Dussault
Quebec, Canada

TO A BETTER SKETCH

Editor:

Since the printing of my program *Color Sketch* in October's *Rainbow*, I have had several calls about running the program on a 16K machine as the article says can be done. Though it is true that the program can be run on a 16K machine, I failed to include the necessary modifications to do this. This letter will correct this oversight.

In order to run the program on a 16K machine, the following lines must be changed:

```
Line 5 change to . . .
CLEAR 1200,&H3EFF

Line 6 change to . . .
DEF USR=&H3F00

Line 11 change to . . .
FOR MM=&H3F00 TO &H3F1B
```

These changes should allow 16K users to run the program with no problems. Thanks to *Rainbow* and all who have called and complimented the program.

Darryl Kotcher
Canton, MI

INFORMATION PLEASE

Editor:

Do any of your readers use a Japusa MQS-80 printer with their CoCo (also known as a Tec-Writer I). I am happy with the way it works and find the text very clear considering it only has a 7-wire print head and is cheaper then a DMP 100. However, I would like to know if there is a screen-print program for it, or will most screen-print programs work? Anyone interested in sharing notes may contact me at 273 Park St. N., Peterborough, K9J-3W3.

Over the last year and a half my CoCo has grown from 4K to its present 64K ECB with direct audio and composite video out, and the Super-Pro keyboard. In the same time I have watched *the Rainbow* grow from a few pages to its present colossus, and somehow it just gets better and better. I enjoy them both immensely. They make a perfect team. Keep up the excellent work.

Hubert Wren
Ontario, Canada

Editor:

I would like to know how some of the readers come up with these poke statements for the various marketed games. How these users arrived at these specific pokes is unknown to me. Does it require a special software pack or can it be done by anybody? Also, is there anyone who knows how to get out of Ray Sato's *Dungeon of the Gods*? I have tried in vain to find the way out. It seems to have no exit.

David Ravn
Jacksonville, IL

Editor:

I need a program that can permit creation of say, 20 different symbols and then will recall any of these from memory and draw them on the screen at cursor location. One should then be able to correct these (pipe fitting) symbols by 'pipe lines' to show a pipe diagram or small system. A screen dump to printer (Gemini 10X) would be required plus, if possible, an ability to add dimensions.

A table, listing material type and quantities should also be 'generatable' to add to the pipe sheet — a 8½ by 11 inch printout. I'm ready to pay for a good solution if the response is rapid. Thanks *Rainbow*, for a super magazine. My son and I almost fight over who gets it first!

Mike Waters
Tracy, P.Q., Canada

GAMES, GAMES, GAMES

Editor:

If someone in Cocoland has some answers to *Sands of Egypt*, preferably how to finish or get *in* the pyramid, I would appreciate it. Send all clues and solutions to me at 2830 Riverside Dr., Apt. 105 B, 33065.

Mike Rothman
Coral Springs, FL

Editor:

I need help on the games *Beyond the Cimmeon Moon* and *Poltergeist*. If anyone knows any clues, please write me at Box 275 R.R. #1 Clark 41653. My main problems are finding things that are hidden on *Cimmeon Moon*, and getting past the third screen on *Poltergeist*.

Michael Rosenberg
Prestonburg, KY

Editor:

I have helpful hints to solving *Pyramid.* I have answers to questions such as "How do you cross the bottomless pit which is too wide to jump?"; "How do you open the sarcophagus?"; "How do you kill the serpent?"; "How do you get to the hole above the east pit in the two-pit room?"; and "How do you get fresh batteries for your lamp?" If you need help in *Pyramid,* just send a self addressed stamped envelope to 1450 Picadilly St., 23513.

Harry L. Perkins, III
Norfolk, VA

PEN PALS

Editor:

I am starting a CoCo pen pal service. If there is anyone interested, please send a letter to me at 29 Eagle Rd., 07746. With your letter include your name, address, what kind of things you like to do with your computer, and 25¢. This is to provide for envelopes and stamps. I think your magazine is great. Keep up the good work!!

Michael Holzer
Marlboro, NJ

KUDOS

Editor:

The Rainbow deserves a great deal of credit for the fine job it has done in bringing to light the many applications, ins and outs, intricacies, updates — in short — the word of the Color Computer to the general public in a package that is not only relevant to the experienced computer operator, but to the novice as well. As computers become more and more a way of life, surely one day a person without knowledge of computers will be deemed "illiterate." That future may be much closer than any of us expect, and it is a comfort to know that magazines like yours are there to push us along. Keep up the good work!

William F. Jourdain
Macon, GA

Editor:

I picked up my first copy of *Rainbow* in December of 82. I've loved every issue since then. Your graphics issue was spectacular.

I was astounded at *Rainbow Roach.* Then when *Marathon* hit the screen I just looked at it with awe! It took some debugging but I regret that somebody wouldn't type in that game.

Keep up the good work. Can't wait 'til next month, and the next, and the next . . .

Brian S. Graham
Cleveland, TN

Editor:

This is my first letter to any magazine. You have a fine little magazine compared to others that I receive. One CoCo magazine I've read is poorly written, printed sometimes illegibly, and full of grammatical errors. Another one, although it sometimes has good information, is so arrogant, I get turned off.

Robert I. Cheney
Rio Piedras, PR

BULLETIN BOARD SYSTEMS

Editor:

I am proud to announce a new CoCo Bulletin Board. The Seven Hills Hillbilly Board of Forest, Virginia supports uploading and downloading, and has many sections. They include anything from graphics to an electronic magazine. We also have electronic mail, and a disk full of downloads. We are devoted to CoCos, but all types of computers are welcome. Currently we have Apples, Model 100s, and Commodores. We are running the most efficient software available, and it is ideal for long-distance callers. Access us at 804-525-0312.

Charles E. Moore
Forest, VA

Editor:

I am the Sysop of the Colour 80 Bulletin Board, and it is open 24 hrs. It is a highly modified version of the Lee Blitch CoCo Board II. It uses Pete Lyall's new driver, along with a lot of my own modifications, to make it one of the best and fastest CoCo Bulletin Boards in the nation. It features five online games including *Star Trek* and *Eliza,* a message file called Free Forum, and a huge download section.

The phone number of the Board is (904)

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Wizard Pendleton
Orange Park, FL

A TIMELY CORRECTION

Editor:

In reference to my program *Appointment Book*, which appeared in the November *Rainbow*. My accompanying article was left out of the magazine, and for those of you who are interested in the program; First, many instructions were in the original article and not present in the write-up. For instance, items can be deleted from the appointment book as they are displayed to the screen (not during input, during display). Pressing D will delete the appropriate item. Second, in response to requests, a newer version displays a calendar graphically on the screen and prints out data one month at a time. Third, copies of the new version with full documentation are available from me at the address 6609 Westmoreland Ave., 20912, for $9.50, and I am also available to give advice and assistance.

Bill Bruck
Takoma Park, MD

AN EXCEPTIONAL CONTRIBUTION

Editor:

My wife and I have left the ranks of public school teachers to form a private school which is oriented in basic academics and specializing in the exceptional child.

Currently, as we struggle financially to stay in existence, we are using our Personal Color Computer with both gifted and learning disabled students.

We would be most grateful for any type of hardware or software to be used with our CoCo. We are a not-for-profit corporation and all donations are tax deductible. In addition, we will write all contributors, telling them how their gift will be used with our students. Please send contributions to: Chillicothe Alternative School, Inc., 1515 North Second 61523.

Richard D. Gordley
Chillicothe, IL

BOUQUETS AND BRICKBATS

Editor:

I am writing this letter using the *VIP Writer* and am having a wonderful time doing it. This is an amazing product. However, my real reason for writing this letter is to let your readers know of the company and product that has allowed me to upgrade my CoCo so as to be able to use the Writer to its fullest advantage. I used the Skyline 64K Memory Upgrade Kit to improve my "D" board 16K Extended CoCo to its full potential. Since I get three of the four CoCo oriented magazines and borrow the fourth from a friend, I have seen all of the published 64K upgrade methods. None was as simple as the one provided by Skyline with its memory chips. This upgrade used wirewrapping, not soldering, and required no cutting of capacitors. It also has chip sockets so that it is removable at will. I am a physician, not an electrician, but still had the upgrade up and running in half an hour and that was only because of my need to undo and fix some of my work while learning from experience.

I hope that passing on my experience can be helpful to others who also wish to upgrade their computers but are afraid to play around in its innards.

Howard A. Glick, MD
Leesburg, VA

FAST SERVICE

Editor:

We just got an Olivetti Praxis 41 typewriter/printer. Its Baud rate is 96, and we need to know how to *POKE96* Baud into CoCo's RAM.

I would also like to commend Petrocci Freelance Associates for their fast service. We ordered their *Bowling Secretary* program by mail on a Friday and received the program the following Tuesday.

I would also like to commend *the Rainbow* on its wonderful service and *the Rainbow* soundsheet. This just proves that your magazine and the CoCo are the best in their fields.

Paul Wylie
Scottsdale, AZ

Editor:

Last year I took a friend's advice and instead of buying Intellivision for my son's birthday, I bought a Color Computer. He also suggested I subscribe to *the Rainbow*.

As so often stated in your magazine, I received a great deal more than I could have ever imagined in the computer and I can say the same for your magazine. Without your magazine, I would not have access to all the fine programs, knowledge, reviews and information that makes the CoCo the powerful instrument it is.

I have ordered a goodly amount of software from your advertisers, and while I have had my problems (some quite exasperating) I would especially like to commend one that has been of tremendous help to me and has gone far beyond what anyone could expect in the way of service.

The company is Transformation Technologies and I wholeheartedly recommend their programs for those like myself who have absolutely no computer training. With Transformation Technologies' help, I have an up and running word processor, database, mailing list and merger for under $75.

The ads and prices may be small but the product is big in quality and service. If you are looking for programs that are easy to use, I highly recommend Transformation Technologies.

Jack Thompson
Gaithersburg, MD

AN UPLIFTED UPGRADER

Editor:

I recently did the 64K upgrade offered by "Selected Software" on my 16K "F" board. I found it very easy to do and it works perfectly. I'm one of these guys that's all thumbs and my prior electrical experience was repairing electrical cords and the like. I would like to encourage all of your readers to upgrade their CoCos themselves.

F. M. Logullo
Hockessin, DE

CLUBS AND MORE CLUBS

Editor:

I would like to inform your readers of the Peoria Color Computer Club for the Color Computer users in Peoria, Ill. and the surrounding area. We meet on the second and fourth Saturdays of each month at 10 a.m. at the Germantown Hills Fire Station in Germantown Hills. For further information please contact me at 102 Twin Oaks Ct, 61611 or call (309) 694-4703.

Harold E. Brazee
East Peoria, IL

Editor:

I am writing to announce the formation of a new international Adventurer's club for all CoCo users interested in playing or writing adventure programs. Members will maintain contact through a monthly newsletter.

For more information contact me at 84 Camberley Cres., Brampton, L6V 3L4, phone (416) 451-9452.

Maurice Dow, Ph.D.
Ontario, Canada

Editor:

On behalf of other CoCo enthusiasts, I would like to invite groups and individuals, in the U.S. to correspond with fellow users in Australia.

We read with envy each month about the enormous amount of software and hardware available to your readers in the States. By communicating with interested people, we may find ways to overcome some of the problems in getting that great suff out here.

Thus, by creating this "bridge" between our countries, we hope to obtain and exchange information and ideas on the fantastic Color Computer.

Any initial contact can be made c/o Penrith Users Group, 16 Tent St., 2750 N.S.W.

David Cunningham
Kingswood, Australia

Editor:

Anyone in the Athens, Georgia area who is interested in visiting or joining a Color Computer Club, there is a group that meets the first and third Tuesday at 7:30 p.m. in Room 381 of the Science Library at the University of Georgia. If you need more information, write to me at Route 2, Box 165-A, or simply come to the meetings.

Robert Hendrix
Watkinsville, GA

Editor:

I would like to announce to all your readers the formation of the Greater Toledo Color Computer Club. The club meets the first Thursday of the month at the Wernert Civic Building on Douglas, north of Laskey, in Toledo. The meeting time is 7:30 p.m. For more information, call 478-6961 or 537-1432.

John Nyitray
Sylvania, OH

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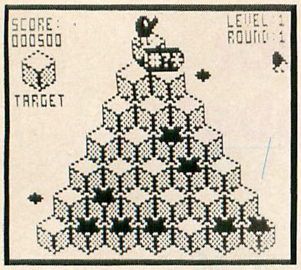

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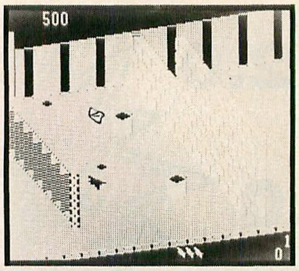
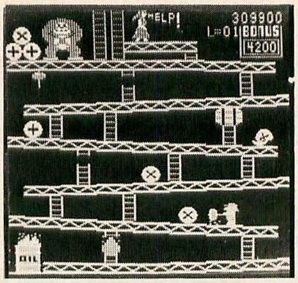
By Spectral Associates. Very much like the arcade smash! Jump little Cubix around the 3D maze trying to change the color of all the squares. With Death Globes, Discs, Snakes, etc. 32K Tape: $24.95

ZAKSUND

From Elite Software comes this fantastic arcade style space action game with 3 different stages of moving 3-D graphics. You've never seen anything like this on your CoCo! Great sound too! 32K Tape: $24.95



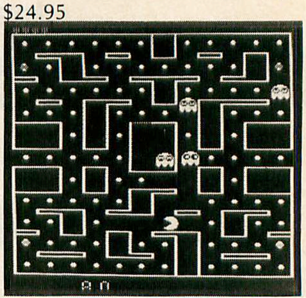


THE KING

Previously called 'Donkey King', you simply cannot buy a more impressive game for your CoCo. With 4 different screens and loads of fun! From Tom Mix Software. 32K Tape: $25.95

GHOST GOBBLER

From Spectral Assoc. This "PAC" theme game has been improved several times. It is definitely the best of its type. Brilliant color, action and sound, just like an arcade. 16K Tape: $24.95



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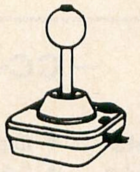

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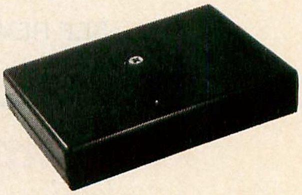

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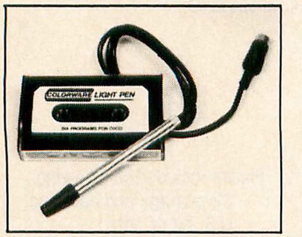

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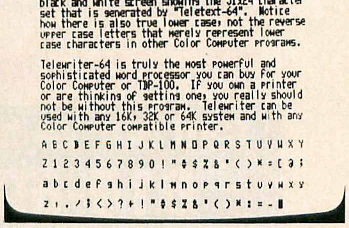
TELEWRITER-64



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TELEWRITER-64

This is an actual unretouched poloroid photo of a
black and white screen showing the 51x24 character
set that is generated by "Teletext-64". Notice
how there is also true lower case, not the reverse
upper case letters that merely represent lower
case characters in other Color Computer programs.

Telewriter-64 is truly the most powerful and
sophisticated word processor you can buy for your
Color Computer or TDP-100. If you own a printer
or are thinking of getting one, you really should
not be without this program. Telewriter can be
used with any 16K, 32K or 64K system and with any
Color Computer compatible printer.

A B C D E F G H I J K L M N O P Q R S T U V W X Y
Z 1 2 3 4 5 6 7 8 9 0 ! " # $ % & ' ( ) * = [ @ ;
a b c d e f g h i j k l m n o p q r s t u v w x y
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Making your computer talk couldn't be any easier! 'Real Talker' is a full featured, ready to use, HARDWARE voice synthesizer system in a cartridge pak. It uses the Votrax SC-01 phoneme synthesizer chip to produce a clear, crisp voice.

FREE TEXT-TO-SPEECH

Included free with 'Real Talker' is Colorware's remarkable Text-to-Speech program. This is a truly powerful machine language utility. What it does is automatically convert plain English to speech. And it has an unlimited vocabulary! For example, use it in the direct mode: Type in a sentence or a paragraph, even mix in numbers, dollar signs, etc., then press enter. The text is spoken. At the same time a phoneme string is generated which can be saved to cassette or disk, modified or used in a Basic program.

We originally planned to sell this major piece of programming for about $40.00 but decided it was so useful that no 'Real Talker' user should be without it. Besides, it really shows off the capability of 'Real Talker'.

Also included with 'Real Talker' is our unique Phoneme Editor program. It allows you to explore and create artificial speech at the phoneme level. Phenomes are the fundimental sounds or building blocks of word pronunciation. There are 64 different phenomes, as well as 4 inflection levels at your disposal. Creating and modifying speech at the phenome level is both fascinating and educational. The Phenome Editor may also be used to customize the pronunciation of speech produced by the Text-to-Speech program.

You don't have to use any of our utility programs though. If you write your own Basic Programs, you will find the pocket sized Votrax Dictionary (included free) is all you need to make your own Basic programs talk. This dictionary gives you quick access to the phenome sequences used to create approximately 1400 of the most used words in the English language.

How about compatibility? 'Real Talker' is compatible with any 16K, 32K, 64K, Extended or non-extended Color Computer. It works with any cassette or disk based system, with or without the Radio Shack Multi-slot expander. No other synthesizer under $100 can make this claim. Most other CoCo voice synthesizers require an expensive Multi-slot expander in order to work with the disk system. 'Real Talker' requires only an inexpensive Y-adapter. This is an important consideration if you plan on adding a disk or have one already.

'Real Talker' comes completely assembled, tested and ready to use. It is powered by the CoCo and talks through your T.V. speaker so there is nothing else to add. Price includes Text-to-Speech and other programs on cassette (may be transferred to disk), User Manual and Votrax Dictionary. ONLY $59.95

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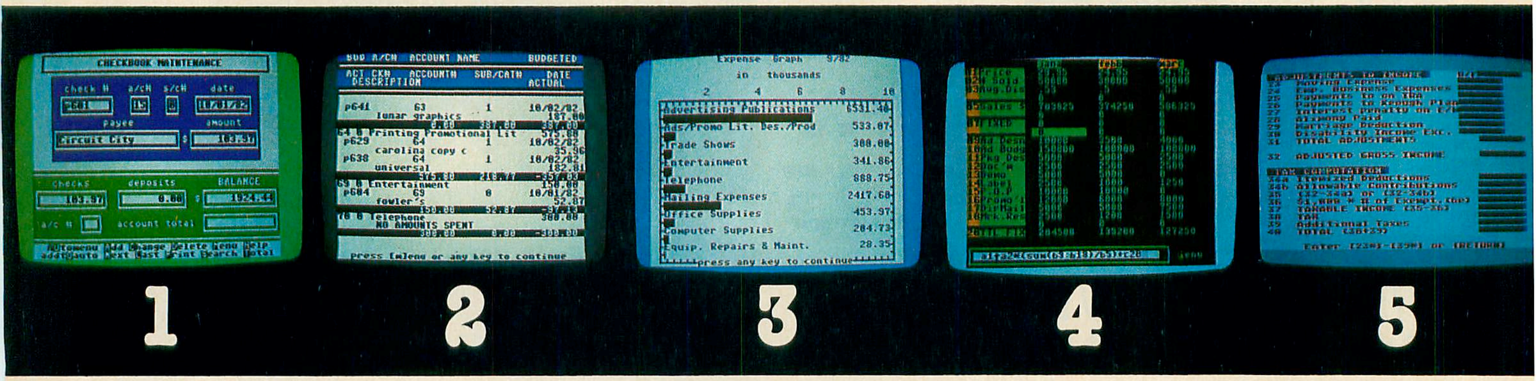

actual screen display *indicates function being shown

Chart of Accounts
*Checkbook Maintenance
Check Search
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*Detail Budget Analysis
Summary Budget Analysis
Income/Expense Statements
Net Worth Statement

Appointments Calendar
Payments Calendar
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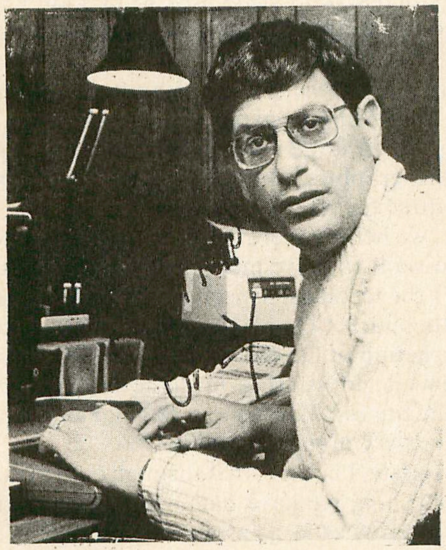

Well, it is 1984 and we have some really exciting news to kick off the new year. Frankly, the biggest problem that I have is in deciding which of the pieces of news is the *most* exciting. To my mind, the best way to resolve that question is simply to address which of them you will have to make plans for the most — and since one of them will be coming your way no matter what you do, we'll start with the one that requires some action on your part.

What I'm talking about is the second **RAINBOWfest** of the season, to be held in Long Beach, Calif., on Feb. 17-19, 1984. This promises to be one of the biggest events of the year.

We choose to go to beautiful, sunny Southern California in the dead of winter because we figured it might be just the thing for a mid-winter vacation. And, now here's a bonus! The weekend is the one during which Washington's Birthday will be observed, so that means most of you (and your kids) will have an "extra" day of vacation. It is one of those long weekends the "Monday Holiday" concept has given us.

So, for **RAINBOWfest** — Long Beach, you have an extra day to enjoy the sun and warm weather of Southern California. And what an opportunity for enjoyment. The Hyatt-Regency Long Beach (our convention hotel, and brand new, I might add) is just 20 minutes away from Disneyland, 20 minutes from Marineland, 25 minutes from Knott's Berry Farm and about 20 minutes from Universal Studios, which has one of the most unique tours I've ever seen. And, a big bonus: The hotel is also just five minutes by water taxi from the Queen Mary, which is moored in Long Beach Harbor. Howard Hughes' "Spruce Goose," the world's largest airplane, is also in the Harbor. And, yes, you can watch the sun set over the balmy blue Pacific right from your hotel room.

What I'm trying to get across is that here is a chance for a really great family vacation. There's a great recreation area right across from the hotel, too, so for the non-computer people in your family, there will be *plenty* to do while the computer people spend time at **RAINBOWfest** itself. There are special room rates at the Hyatt (just mention **RAINBOWfest**) and the hotel is one of the most beautiful we've seen.

More important, there's a lot of talk in the industry about this particular show simply because of the time of the year we're having it. It is a chance for the exhibitors to get away from the cold, too. And early indications are that a lot of people will be taking advantage of that opportunity! So, **RAINBOWfest** in Long Beach promises to be one of the bigger shows we will have this year!

With all the talk of Disneyland, sun, balmy skies and the Queen Mary, let's not forget that we have a couple of special things lined up that will make this show something extra.

For one thing, we have plans for a couple of programs on Women and Computers — working from both sides of the fence. Plans are for some of the women who are active in the computer industry to be talking about computers and computing. Here is an opportunity for women to meet women who have a common interest in an area which (we believe wrongly) too many seem to take for granted as a "man's world."

But for those of you who are "unreconstructed" and just *hate* CoCo (what!), another session is planned as well. Here, we're interested in helping you air your gripes about computing with others who have the same ideas. And, while we are billing this as a "woman's" session, men who feel "left out" are cordially invited to attend as well.

Also on the seminar schedule, a special session with Phil Kitchen of Radio Shack. Phil is in charge of the Third Party Software Support program for Tandy and will be meeting with those who are interested in marketing programs. If you've ever thought about selling software, here's a great opportunity to get some inside information and help.

Let's not forget our "CoCo Community Breakfast." Bob Albrecht, one of the foremost authors in the computer world and a *Rainbow* columnist, will be the keynote speaker. Don Inman, one of Bob's cohorts and another columnist, will be giving a seminar on *LOGO* especially aimed at educators and young people. And, we're also trying something new in the seminar field this time: Members of the Dymax Team, working under the name of the "Dragons Of Menlo Park," will be hosting an open-ended seminar on any CoCo topics *you* want to discuss. These, plus a host of other seminars and workshops, add up to a very interesting program in addition to the exhibits.

And speaking of the exhibits, this **RAINBOWfest** comes at the very height of the post-Christmas season. With hundreds of thousands of new CoCos expected to be sold, software and hardware vendors will be introducing a wealth of new merchandise at the show. And remember, one ticket gets you admission to the show floor and all the programs (except the breakfast, which is extra).

And we have two extra-special incentives for you. The first 500 ticket orders will receive a free *Rainbow* poster, a handsome full-color reproduction of our January, 1983, cover. *Plus*, the first five ticket orders from *each state and province* will receive one of our new **RAINBOWfest** tee shirts. This is a special design for the Long Beach show, featuring our logo of a CoCo and a palm tree. And, yes, you can buy others at the show!

Most of all, **RAINBOWfest** will be fun! So, plan to be with us in Long Beach in February. There is a ticket order blank on Page 190 of this issue.

We're just as excited about the second piece of news that we have to announce this month — the inauguration in February of a technical section of *the Rainbow*.

Dale Puckett, our OS-9 columnist, will be one of the featured writers in the new Technical Section, but he will be joined by at least two top-notch people with years of experience in the 6809 field.

One of these new people is Frank Hogg, president of Frank Hogg Laboratory. The other is Paul Searby, owner of Computerware and a long-time dealer, programmer and technical whiz with 6809 systems.

In addition to these new members of the staff, we encourage you to contribute material for the Technical Section, which will be incorporated as a special part of *the Rainbow*. As such, it will be easy to find and will, we believe, provide a wealth of detail and information on more sophisticated uses of the Color Computer and 6809 programming.

I felt extremely fortunate to have Dale join us several months ago and I feel just as proud that Frank and Paul will be with us beginning next month. You've already read some of the nice things I've had to say about Dale, but let me add that Frank is a unique individual who has provided excellent insight into technical aspects and advanced operating systems of the Coco several years now while Paul has been a part of personal computers from the days you had to build your own — and he did.

You might ask whether we are planning to turn *the Rainbow* into a high-tech magazine. The answer is no. We will continue to offer a large number of games, hints and tips, practical uses, graphics, utilities and just-for-fun programs as we have done before.

However, we believe there is a growing segment of CoCo owners who want to delve more deeply into programming and some of the technical aspects of the 6809. This natural growth of the market (as evidenced, we believe, by Radio Shack's marketing of OS-9) will be addressed through our new section while not stinting on all the less technical things which have made *the Rainbow* so popular to tens of thousands of you every month.

We're fortunate, I believe, that through our two and a half years of publishing we have had *your* support which has allowed us to grow as large as we are. Because of that, we believe there is *room* to address additional aspects of the CoCo world without taking anything away from what we do now.

As always, I look forward to your comments on this move and encourage you to let us know what you think about it.

Finally, one of the questions I get asked the most these days concerns the demise of the Atari and Texas Instruments computers and how I believe they will affect the Color Computer.

You have seen me write several times about my admiration for the people at Radio Shack who do the planning for CoCo and it is significant to me, at any rate, to say that I feel that admiration seems to be hanging out there for all to see in light of the TI and Atari news.

While these two firms are the first victims of the "shakeout" that industry-watchers have been predicting for some time, I think it is instructive to note that Tandy produced a 24 percent *increase* in profit during its last fiscal year. Sure, Tandy sells more than computers, but it is my understanding that computers in general, and CoCo in particular, had a lot to do with that increase.

So, my answer is that I believe the "shakeout" won't do anything but help our favorite computer. When you can buy a computer as complete as CoCo for as little as it sells for today, and get the widest range of additional equipment available on the market at prices as reasonable as they are, you can only expect that the future looks rosy indeed from Tandy Towers.

And that's good for us, too. Because it means that there will be more and more people seeing what so many of us have seen for so long, that we have the best computer available for the best price anywhere. That will only swell our ranks as CoCo owners, bring about even more products and help CoCo expand even more.

Tell a friend about your Color Computer. You'll be doing him or her a *big* favor!

(And while you're at it, tell them about us, too. OK?)

—Lonnie Falk

POKES, PEEKS & EXECS FILE

Get complete Color Computer power with this exhaustive file containing over 100 pokes, peeks & exec commands with full comments for each. Hi-speed pokes, break disables, list disables and much more! We will even give you a bonus - Tape-to-Disk copy program. All this for only $5.00 (Postpaid). File on Tape $7.50, File on Disk $9.50 (Postpaid).

Recent Supplement to Pokes, Peeks & Execs file with 50 additional pokes, peeks & execs, only $3.00 (Postpaid).

HIDE-A-BASIC

A perfect utility to protect your programs with 4 self-executing ML routines to disable list, break-key, reset and create an error skip routine. 16K Ext. Basic. Cassette $16.95.

CARTRIDGE DUMP

Transfer most Rompaks to tape or disk. No need to take out the disk controller. 16K or 32K Ext. Basic Cassette $14.95.

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Telewriter-64™

the Color Computer Word Processor

- **3 display formats: 51/64/85 columns × 24 lines**
- **True lower case characters**
- **User-friendly full-screen editor**
- **Right justification**
- **Easy hyphenation**
- **Drives any printer**
- **Embedded format and control codes**
- **Runs in 16K, 32K, or 64K**
- **Menu-driven disk and cassette I/O**
- **No hardware modifications required**

THE ORIGINAL

Simply stated, Telewriter is the most powerful word processor you can buy for the TRS-80 Color Computer. The original Telewriter has received rave reviews in every major Color Computer and TRS-80 magazine, as well as enthusiastic praise from thousands of satisfied owners. And rightly so.

The standard Color Computer display of 32 characters by 16 lines without lower case is simply inadequate for serious word processing. The checkerboard letters and tiny lines give you no feel for how your writing looks or reads. Telewriter gives the Color Computer a 51 column by 24 line screen display with *true lower case characters*. So a Telewriter screen looks like a printed page, with a good chunk of text on screen at one time. In fact, more on screen text than you'd get with Apple II, Atari, TI, Vic or TRS-80 Model III.

On top of that, the sophisticated Telewriter full-screen editor is so simple to use, it makes writing fun. With single-letter mnemonic commands, and menu-driven I/O and formatting, Telewriter surpasses all others for user friendliness and pure power.

Telewriter's chain printing feature means that the size of your text is never limited by the amount of memory you have, and Telewriter's advanced cassette handler gives you a powerful word processor without the major additional cost of a disk.

> *...one of the best programs for the Color Computer I have seen...*
>
> — Color Computer News, Jan. 1982

TELEWRITER-64

But now we've added more power to Telewriter. Not just bells and whistles, but major features that give you total control over your writing. We call this new supercharged version Telewriter-64. For two reasons.

64K COMPATIBLE

Telewriter-64 runs fully in any Color Computer — 16K, 32K, or 64K, with or without Extended Basic, with disk or cassette or both. It automatically configures itself to take optimum advantage of all available memory. That means that when you upgrade your memory, the Telewriter-64 text buffer grows accordingly. In a 64K cassette based system, for example, you get about 40K of memory to store text. So you don't need disk or FLEX to put all your 64K to work immediately.

64 COLUMNS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 × 24 and 85 × 24!! Both high density modes provide all the standard Telewriter editing capabilities, and you can switch instantly to any of the 3 formats with a single control key command.

The 51 × 24 display is clear and crisp on the screen. The two high density modes are more crowded and less easily readable, but they are perfect for showing you the exact layout of your printed page, *all on the screen at one time*. Compare this with cumbersome "windows" that show you only fragments at a time and don't even allow editing.

RIGHT JUSTIFICATION & HYPHENATION

One outstanding advantage of the full-width screen display is that you can now set the screen width to match the width of your printed page, so that "what you see is what you get." This makes exact alignment of columns possible and it makes hyphenation simple.

Since short lines are the reason for the large spaces often found in standard right justified text, and since hyphenation is the most effective way to eliminate short lines, Telewriter-64 can now promise you some of the best looking right justification you can get on the Color Computer.

FEATURES & SPECIFICATIONS:

Printing and formatting: Drives any printer (LPVII/VIII, DMP-100/200, Epson, Okidata, Centronics, NEC, C. Itoh, Smith-Corona, Terminet, etc).

Embedded control codes give full dynamic access to intelligent printer features like: underlining, subscript, superscript, variable font and type size, dot-graphics, etc.

Dynamic (embedded) format controls for: top, bottom, and left margins; line length, lines per page, line spacing, new page, change page numbering, conditional new page, enable/disable justification.

Menu-driven control of these parameters, as well as: pause at page bottom, page numbering, baud rate (so you can run your printer at top speed), and Epson font. "Typewriter" feature sends typed lines directly to your printer, and Direct mode sends control codes right from the keyboard. Special Epson driver simplifies use with MX-80.

Supports single and multi-line headers and automatic centering. Print or save all or any section of the text buffer. Chain print any number of files from cassette or disk.

File and I/O Features: ASCII format files — create and edit BASIC, Assembly, Pascal, and C programs, Smart Terminal files (for uploading or downloading), even text files from other word processors. Compatible with spelling checkers (like Spell 'n Fix).

Cassette verify command for sure saves. Cassette auto-retry means you type a load command only once no matter where you are in the tape.

Read in, save, partial save, and append files with disk and/or cassette. For disk: print directory with free space to screen or printer, kill and rename files, set default drive. Easily customized to the number of drives in the system.

Editing features: Fast, full-screen editor with wordwrap, block copy, block move, block delete, line delete, global search and replace (or delete), wild card search, fast auto-repeat cursor, fast scrolling, cursor up, down, right, left, begin line, end line, top of text, bottom of text; page forward, page backward, align text, tabs, choice of buff or green background, complete error protection, line counter, word counter, space left, current file name, default drive in effect, set line length on screen.

Insert or delete text anywhere on the screen without changing "modes." This fast "free-form" editor provides maximum ease of use. Everything you do appears immediately on the screen in front of you. Commands require only a single key or a single key plus CLEAR.

> *...truly a state of the art word processor... outstanding in every respect.*
>
> — The RAINBOW, Jan. 1982

PROFESSIONAL WORD PROCESSING

You can no longer afford to be without the power and efficiency word processing brings to everything you write. The TRS-80 Color Computer is the lowest priced micro with the capability for serious word processing. And only Telewriter-64 fully unleashes that capability.

Telewriter-64 costs $49.95 on cassette, $59.95 on disk, and comes complete with over 70 pages of well-written documentation. (The step-by-step tutorial will have your writing with Telewriter-64 in a matter of minutes.)

To order, send check or money order to:

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Or check your local software store. If you have questions, or would like to order by Visa or Mastercard, call us at (619) 755-1258 (weekdays, 8AM-4PM PST). Dealer inquiries invited.

(Add $2 for shipping. Californians add 6% state tax. Allow 2 weeks for personal checks. Send self-addressed stamped envelope for Telewriter reviews from CCN, RAINBOW, 80-Micro, 80-U.S. Telewriter owners: send SASE or call for information on upgrading to Telewriter-64. Telewriter-compatible spelling checker (Spell 'n Fix) and Smart Terminal program (Colorcom/E) also available. Call or write for more information.)

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COLOR DESIGNER

The ultimate Hi-Res Graphics Processor!!! Great for doodling, sketching, and most of all, creating entire graphics screens. Options include; 8 key cursor control with key repeat, Draw command that follows your cursor, FILL command that "PAINTS" the screen with more than 1000 different color/texture combinations, and much much more!!
16/32K cas $26.95 disk $28.95.
RAINBOW CERTIFICATION SEAL

QUIZ ALL

A versatile quiz program. Has study and test formats and allows printing of quiz. Even includes an option for the computer to generate multiple choice answers!
cas $18.95 disk $20.95

COMPU SCRIBE B.S.A.

Got a headache keeping track of merit badges, rank advancements, etc. Compu Scribe keeps tabs on the whole troop and creates printouts by scout, by rank, or alphabetically. Requires a printer with 132 character mode.
Available on disk only - $26.95.

OKI DUMP

Eight bit screen dump from CoCo to an Okidata printer without dot addressable graphics! Includes hints on printing pictures of game screens, etc. ("The King" by Tom Mix, is the example) a steal at
16K cas $8.95 16K disk $10.95

Happy New Year
Hot Dog!
A Brand New Year.
We resolve to serve you even better!
RAINBOW CERTIFICATION SEAL

Call or write for our free newsletter.
All cassette orders include disk version on cassette with instructions to transfer to disk. Unless otherwise specified programs require 16 K extended for cassette, or 32K extended for disk. Add $2.00 shipping and handling. Utah residents add 5¾% sales tax.
Orders paid by personal check allow 1-2 weeks all others shipped in 24 hours. No COD.
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(801) 571-5023
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BUILDING JANUARY'S RAINBOW

Getting Started Special . . .
New Beginnings Edition . . .
And No End In Sight . . .

Welcome to our Beginner's Issue! If you've just purchased a Color Computer, received one for Christmas, or just discovered *the Rainbow,* I think you'll enjoy this beginner's special. And, if you're one of our regulars, it's an odds-on bet that you'll find something special, too.

You see, in the CoCo Community, we're all beginners of one type or another. Most of us, no matter how long we've been around — and nobody's been around very long in this field — still get a kick out of a short program listing that does something novel. And, regardless of what level of competence we have achieved in personal computing, we all are beginners at something.

Even if you know BASIC as well as *the Rainbow*'s BASIC Guru, Dick White, you'll still learn a trick or two in his "Welcome To BASIC" piece this month. Maybe you know BASIC but are beginning M/L. Many of you have been asking for articles similar to those by Contributing Editor Dennis Lewandowski and Technical Editor Dan Downard to get started in assembly language.

If you're an M/L whiz, how much do you know about the new OS-9? Does the new four-volume documentation for OS-9 looks formidable; Dale Puckett serves up OS-9 in byte-sized chunks.

Game Master Bob Albrecht, has set aside this month to talk about cassette files, offering the sage advice: "You can't record on leader." Hey, *somebody's* got to tell you the first time. And Dragon Master Bill Nolan has called time out to introduce newcomers to the world of fantasy role playing and to announce a contest.

So you're an old hand at memory upgrades. Well, Tony DiStefano takes a look at upgrading the CoCo 2 — and who isn't a beginner at that?

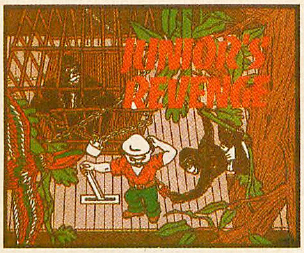
If your own beginning centers around the MC-10 mini-micro, old hand H. Allen Curtis follows up Bob Russell's CoCo memory map this month with an MC-10 memory map.

A word here about the *other side* of *the Rainbow*. If you're just getting to know us, let me remind you about our *Rainbow On Tape. The Rainbow* is simply too big for you to type in all the program listings we have, so you may want to try our tape cassette "magazine" which has all the longer listings that appear in *the Rainbow* each month. They're ready to load in and run — saving you hours of typing and debugging — and you may want to begin this service right now, because the price is going up. Check our tear-out reply card for details.

So, whatever you're beginning, there is something for you in this issue of *the Rainbow*. And, if you've just discovered *the Rainbow*, there may still be time to begin a subscription before the new rates begin on January 1. Join us, won't you, as we work to make every month of 1984 one of new beginnings.

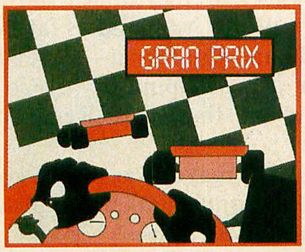
—Jim Reed

Computerware® Hit Parade...



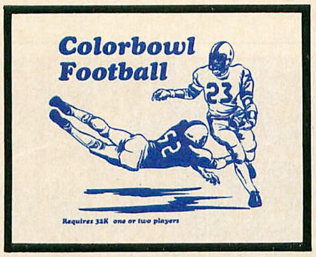
Poor Jr must overcome four screens to rescue The King from Luigi. Traverse the jungle & swamp, climb vines, avoid vine gators, dodge Zuzu birds, open locks, & conquer Luigi's hideout.

32K C $28.95 **32K D $31.95**



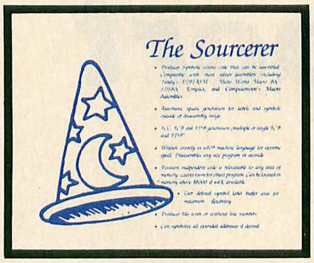
Use speed, skill,. & concentration to race your car over the track, dodge competitors, & beat the clock. Taste the road dust, smell burning rubber, feel the press of speed on your chest!

32K C $21.95 **32K D $24.95**


Colorbowl Football
23
22
Requires 32K one or two players

Big league graphics! Two players against each other or one can practice offense against the computer. 7 defensive & 8 offensive plays plus many formations.

32K C $26.95 **32K D $29.95**



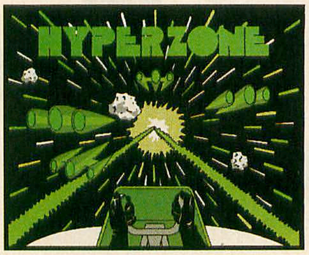
This menu driven symbolic 6809 disassembler produces symbolic source code that can be assembled. Automatic equate generation. FCC, FCB, & FDB generation. Written in position independent code, it is relocatable to any memory area. User defined symbol/label area. Produces files with or without line numbers. Can symbolize all extended addresses if desired. Written in assembly language for extreme speed. Disassemble to disk or cassette, printer, or screen.

16K C $34.95 **16K D $39.95**

Bio Detector™

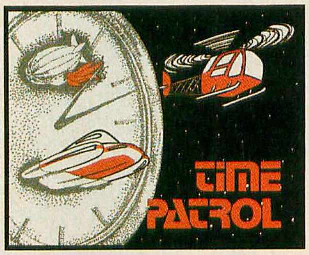
A serious health aid for biofeedback training & a fun family game for "truth detection"! Real silver velcro finger grips attach to the detector box that plugs into the joystick slot. Now watch & listen to the galvanic skin response being graphed on the screen. An impressive experience for a friend who asks "what does your computer do?" All hardware, Bio Feedback program & Anxiety Attack game included. (Results not admissable in court!) (Req. 16K)

$34.95



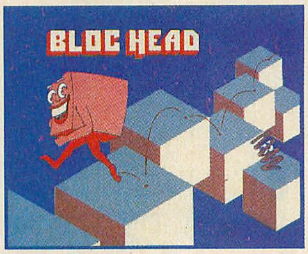
From the cockpit of your ship, see the real 3-D field of hyper space. Dodge oncoming space debris & destroy attackers as they whiz past. A new dimension in space games!

32K C $26.95 **32K D $29.95**



Travel through different time zones, fending off attacking craft from each period with a full 360 degree firing range. See blimps, helicopters, & all kinds of space vehicles.

32K C $26.95 **32K D $29.95**



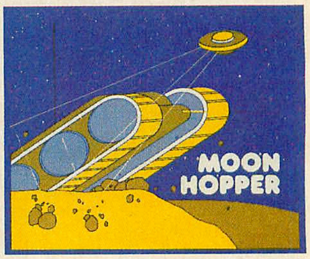
He jumps across pyramids of brightly colored cubes, dodges springs & bad eggs, using elevator squares, & gaining points as he clears the cubes towards the next screen.

32K C $26.95 **32K D $29.95**

Flexi Filer

Comprehensive & flexible data base manager. Collect up to 35 fields with up to 240 characters per record using your own names & format. With logical operators select any subset of records using up to 36 different criteria. Sort all or any subset of records in ascending or descending order on any of the 35 fields, with a fast assembly language sort. Design customized labels & reports with automatic page numbers, page headings, & totals of numeric fields.

32K D $64.95



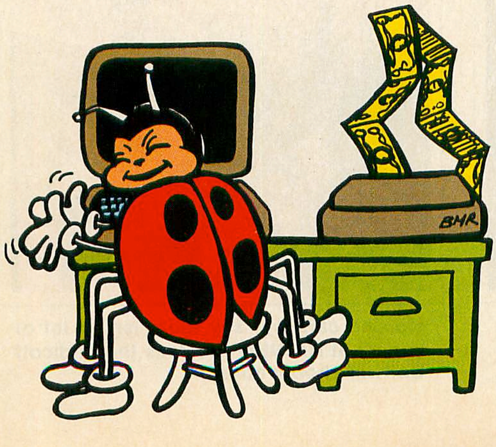
Your landing craft rolls over the surface with its tractors, hops over craters & rocks, & phasers attacking aliens to get to home base. Super graphics & sound!

32K C $24.96 **32K D $27.95**

Color Basic Compiler

For programmers who want the speed of assembly language & the ease of BASIC. 48 commands & functions, most a subset of Extended BASIC. Generates position independent code so a compiled program can reside anywhere in memory. When the compiler converts your BASIC program into machine language, it will run an average of 40 times faster!

32K D $39.95



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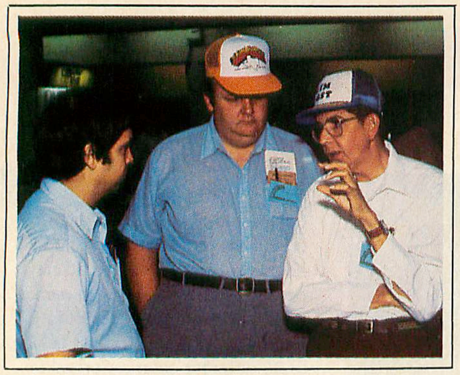


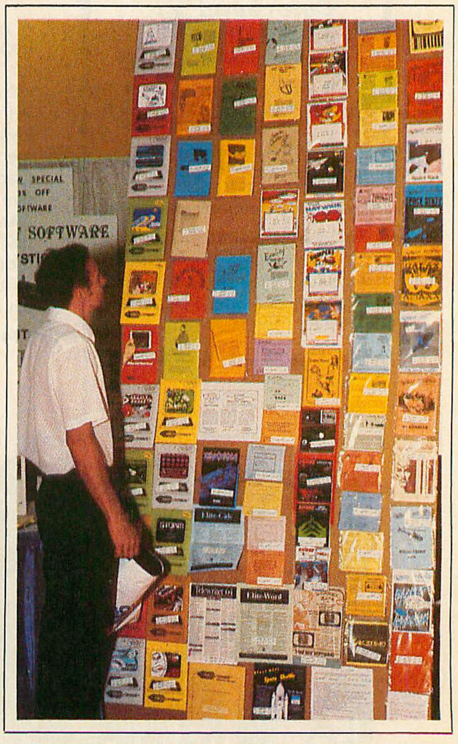
Tom Nelson of Softlaw listens to a buyer sporting a RAINBOWfest hat.

RAINBOWfest Report

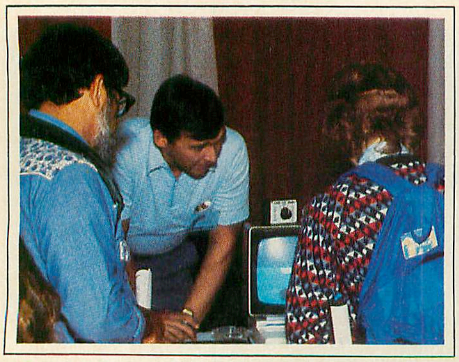
Vern Epps, who came all the way from Canada to Texas to attend RAINBOWfest, stops by the Radio Shack booth to ask some questions about OS-9.

Surely the nicest thing about RAINBOWfest is the people. For the first of the Rainbow's regional shows this year, they came from as close as Fort Worth itself and as far away as Canada and California—all looking to sample a big helping of "CoCo Community" at the Hyatt-Regency Fort Worth.

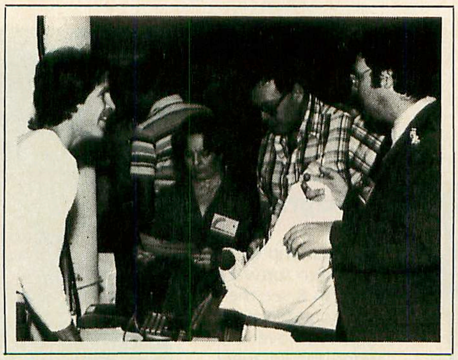
The city's mayor was there to present publisher Lonnie Falk with a proclamation that it was, indeed, "Color Computer Weekend" in Fort Worth, "a division of Tandy Corp." CoCo celebrities abounded and thousands of users spent up to three days viewing exhibits, attending seminars and meeting all those people who were just names on magazine pages or voices on the telephone.



No one can ever say there isn't a lot of variety at RAINBOWfest, as the Endicott Software booth attests.



Dennis Lewandowski listens to a question from a RAINBOWfest attendee.



Dave Lagerquist of Chromasette and Silverware explains his tape magazine to a receptive audience.

Although attendance wasn't as large as the first RAINBOWfest in Chicago last spring (4,100 compared to better than 10,000), the CoCo world was out in force and everyone had a grand time. The smaller crowds made it easier for everyone to get additional information about products and programs on display.

Talk of the show was OS-9, Radio Shack's new multi-user, multi-tasking operating system. In fact, Tandy sold every single copy of OS-9 that was to be found in the Fort Worth area and orders were taken by both Radio Shack and Jack Torres of Computer Plus for many, many more.

New games from a number of vendors, new utilities from others and some spiffy new business programs dominated interest. And, for many, it was a first chance to see products they had been considering. Some early Christmas shopping was very much in order.

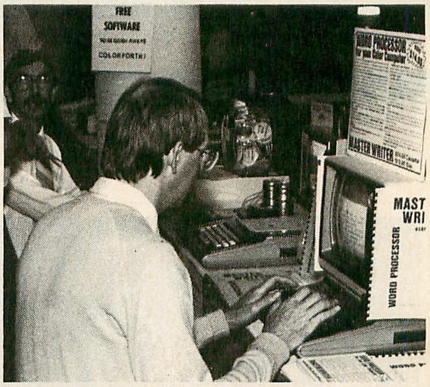
The seminar sessions were a big hit. Frank Hogg ventured out of his laboratory and attracted a bring-extra-chairs-from-down-the-hall, standing-room-only crowd to his talk on advanced operating systems. Steve Blyn waded ashore from Computer Island to talk about educational programming and was the object of turn-about that would have made any kid's heart glad: Signing attendance notes for teachers to take back to school with them.

Yes, the graphics master, Don Inman, was on the program, too, as were program authors John Gabbard (*Keys to the Wizard* and *Android Attack*) and Tim Purves (*Fury*) of Spectral Associates.

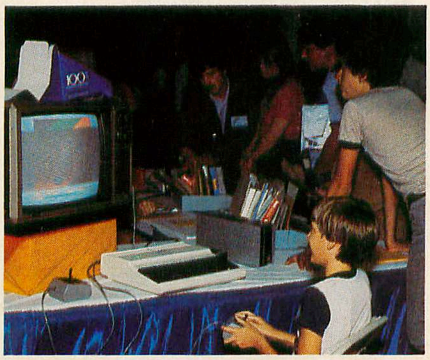
Who else but Bob Rosen of Spectrum Projects would have one of those power microphones that also plays more than 100 ear-shattering tunes? And who else but *Rainbow's* Jim Reed would try to play them all? Would Bob (Captain Eighty) Liddil lose all his magic powers if he took off his trusty leather hat? Where else could you get 64K chips for $39.95 and have them installed while-you-wait? Or log on to CompuServe for free as Sandy Trevor and Bill Louden watched?

The game was the thing at the Computer Shack booth.

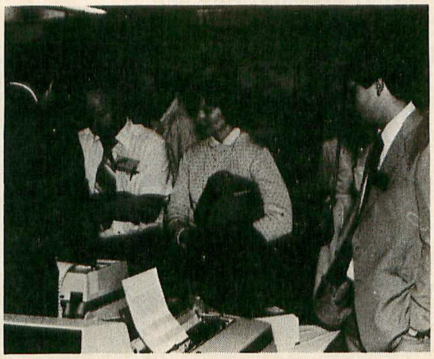
Frank Brandon of Brantex set up his own "Texas Store" to explain his new business program packages.



Mike Anderson of Pyramid edits copy while Armadillo Software's Jerry Alexander explains his monitor program.



Games and utilities were a big hit at the show.



Jack Torres of Computer Plus demonstrates a printer to a group of buyers.

Ron Krebs of Mark Data Products explains his new graphic Adventure games.

ciates and Computer Shack.

Frank Brandon and Dennis Mitchell of Brandtex were there to talk about business systems; Dungeon Master Bill Nolan of Prickly-Pear was on hand; Tom Nelson of Softlaw and Andy Larson of Follett Library Book Company were also part of the learning sessions.

But best of all, RAINBOWfest goers were able to learn something about everyone. For instance, Tom Nelson has a master's degree in Chinese—no wonder he's so good at writing documentation for brother Dan's machine language programs.

You may know that Andy Larson was instrumental in getting Learning Company software for the CoCo, but were you aware that he designed and built his own house (as did Sue and Paul Searby of Computerware) and that he likes to hang by his feet in the hallway for relaxation?

Yes. Contrary to what you might think, everyone in the CoCo world doesn't spend all his time in front of a monitor screen. On the other hand, there's Steve Bjork. On a side trip to Billy Bob's, billed as the world's largest honky tonk, Steve was seen pouring quarters into an arcade game while most everyone else was whooping it up to Tanya Tucker.

Speaking of trips, the tour of the CoCo plant—the first time an outside group has ever been allowed into Tandy's manufacturing facilities—was voted by all as a major highlight of the weekend. And, when RAINBOWfest goers were not computer-watching, they were people-watching.

BLACKJACKPRO

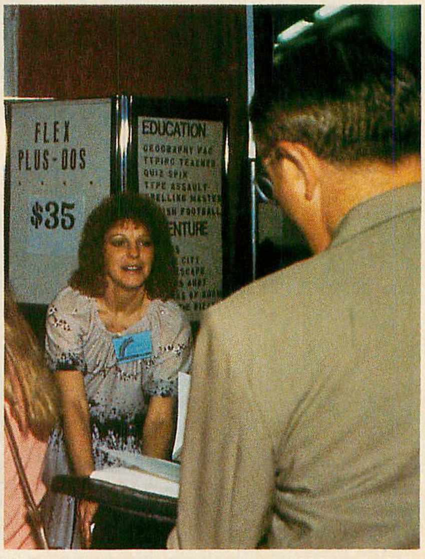
BLACKJACKPRO
A computer assisted learning tool
that will pay for itself.
Expert play will become
easy and natural.
Read about BLACKJACKPRO on page 105
BLACKJACKPRO is a trademark of Skillware Corporation

SKILLWARE

Radio Shack's Mark Yamagata is awarded a plaque by Rainbow publisher Lonnie Falk for being keynote speaker at the CoCo Community Breakfast Saturday.

TOM MIX
SOFTWARE
3424 COLLEGE
GRAND RAPIDS,
49505
Playing a Tom Mix Software game was one of the highlights of the show.

64 k
UPGRADE
While You Wait!
At RAINBOWfest, you didn't need Bob Hope to say "Thanks For The Memories."



Spectral Associates' Cindy Shackleford explains how FLEX+DOS works to a RAINBOWfest-goer.

As in Chicago, the "CoCo Community Breakfast" was a sellout, this time to hear Radio Shack's new director of computer merchandising for personal computer products, Mark Yamagata, give some excellent insight into the future of Tandy marketing and advertising efforts. In fact, Tandy-ites were out in force. *Microcomputer News* editor Bruce Elliott even won a door prize.

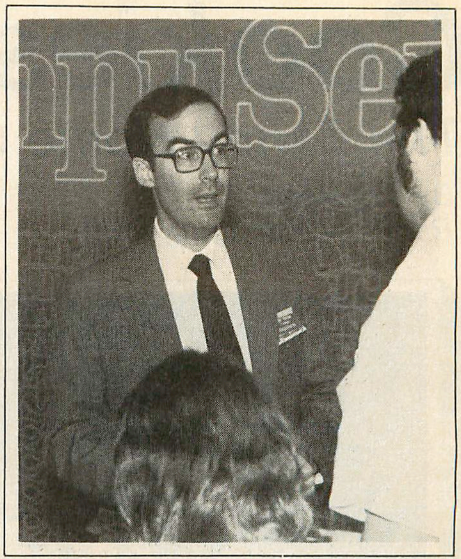
RAINBOWfest in Tandy town. Down the street from One Tandy Center and a short bus ride from Kenji Nishikawa's plant tour. Ed Juge, director of computer merchandising for business products, joined us for breakfast as did Barry Thompson, CoCo Line Manager; Bill Walters, who manages the Model 100 products; Roy Irvine, who handles all the peripherals; Phil Kitchens, who is in charge of third party support and Bill Gattis, VP in charge of the Education Division. A whole host of others, from publicity, advertising, technical support, software buying and quality control were in attendance, too.

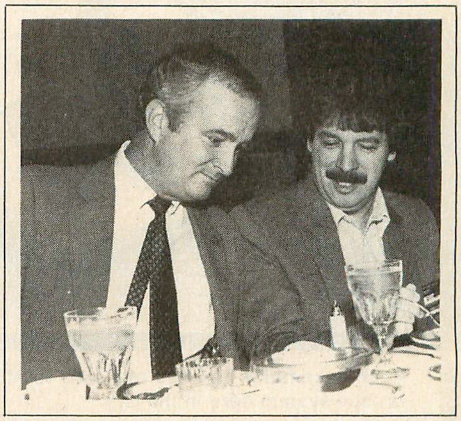
John Ross brought The Answer and Ron and Don Garrett added an International (Color Computer Club) flavor. John and Linda Nielson had MOREton business programs while John Waclo of Elite Software, Joe Bennett of JARB, Cindy Shackleford of Spectral and Bill Ginn of Computer House added to the fun. We were pleased to welcome some other magazines as exhibitors, too. The Wayne Green *(Hot CoCo)* crowd was there as was the Tennessee Gentleman, Larry Williams of *68 Micro Journal* and *Color Micro Journal.*

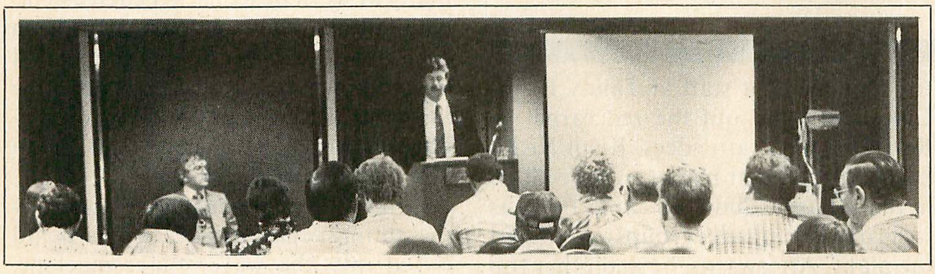
Others brought others. Dennis Lewandowski brought his father while Rosie stayed home. But Giesel Mix, Sara Nolan, Margaret Preble and Mona Krebs brought their husbands Tom, Bill, Larry and Ron.

Yes, most of all it was fun. And, while there were fewer people at Fort Worth than had been at Chicago, we expect that the concept of Regional RAINBOWfests might have had something to do with that. We'll see you all—and many of you again in Long Beach, Calif., February 17-19; New Brunswick, N.J., March 30-April 1; and Chicago June 22-24!

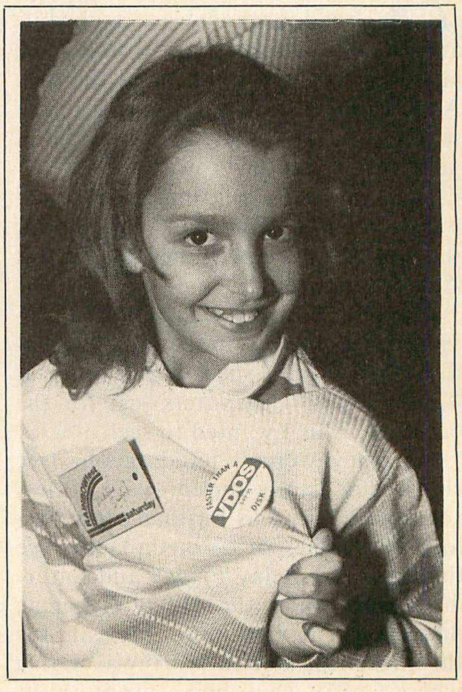
A good time was had by all. And more good times are coming!


CompuServe's Sandy Trevor direct connects with a user.


Ed Juge of Radio Shack and Frank Hogg share some thoughts at the CoCo Community Breakfast.


Andy Larson of Follett Library Book Company talks about educational software at one of the seminar sessions.

VDOS attracts a crowd at Dr. Larry Preble's booth.



Just about everyone had a good time at RAINBOWfest.

Cookies and CoCo:

The Tandy Home Computers Tour

By Jim Reed
Rainbow Managing Editor

Each assembler handles one part to stuff on each board during a given cycle, a unique system here in the U.S.

As we began the descent into the Dallas-Fort Worth airport, I hoped the flight was on schedule and that the airport limo wouldn't be late—otherwise, I might miss the bus. And, I didn't want to miss this bus; I might not get another chance if I didn't go early to beat the crowd.

I was making a pilgrimage of sorts; I was bound and determined—bound for the source and determined to see this Adventure through.

The Fort Worth RAINBOWfest provided a unique opportunity in that Tandy arranged a special open house at Tandy Home Computers just for the occasion. This I wanted to see!

No, they weren't handing out free chips, but Tandy did provide coffee, cola and cookies as busload after busload arrived at CoCo's birthplace to see the facility. All day Friday and Saturday, groups left the Hyatt Regency, downtown, at 45-minute intervals for the short ride out to Northway Drive where CoCos were being produced at the rate of one every five seconds.

Texas hospitality was at its finest as the management staff at Tandy Home Computers laid out the red carpet to RAINBOWfest attendees. Kenji Nishikawa, the general manager, greeted us in the cafeteria and even came along as we broke into smaller groups and toured the plant. Afterwards, he and other top management people were on hand to answer our questions.

The tour itself lasted perhaps 30 minutes—which, like Baby Bear's porridge, was "just right"—and took us step by step from incoming Quality Control assembly to shipping.

With the predominance of white—white walls, white packing and white CoCos—along with much stainless steel and conveyor belts throughout the facility, it felt a bit like touring a big doughnut bakery.

The main manufacturing area, which consists of sub-assembly to final assembly, Quality Control, Quality Assurance, and on to shipping, is a remarkably quiet place, considering all the activity going on. The pace is an unhurried, but steady beat.

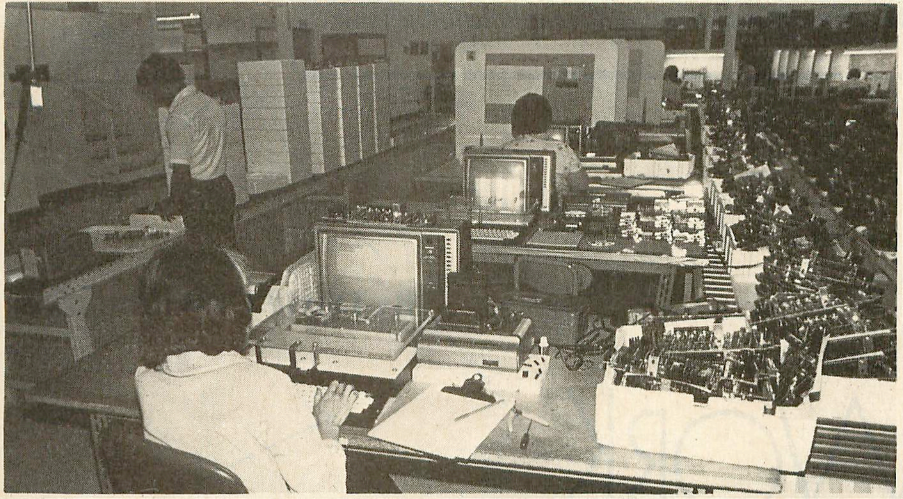
General Manager Kenji Nishikawa took a very active role in the tour.

Our tour guides told us that the printed circuit boards are auto-stuffed at Tandy Instruments, a sister division, and then delivered to any of three carousel lines. Workers on these three lines stuff all components in the P. C. board—capacitors, sockets, I. C.'s, etc., prior to wave soldering.

According to Tandy, the One Piece Insertion Assembly Technique is unique to the United States. It surprised many of us to observe that each assembler only handles one part to stuff on each board until all boards are stuffed and complete one cycle, whereupon the assemblers then start on the next component. Much more hand work than you might have anticipated.

After all components are inserted by the stuffing department, each logic board is fed into the wave solder machine.

THC's employees on the assembly line. There are 600 employees.



Amazingly, 1.7 million transistors function at first power up.

First, the board passes across the flux in order to prepare for better solder activation, then the machine solders eveything in one, 700-degree pass. Radio Shack's' CoCo operation solders at a rate of 5,000 logic boards daily.

After soldering, the board is put through a water base washing process to remove the flux. Interestingly, a commercial dishwasher has been modified specifically for board washing. The boards are then air dried and sent to the lead trim process where blades operating at speeds of 4,000 RPM add a finishing touch by clipping off any excess wire.

After clock frequency adjustment, the first diagnostic test station is Functional Test. In this stage, the logic board first comes to life and is treated as an independent computer by using its own memory to store diagnostic software—then CoCo diagnoses itself!

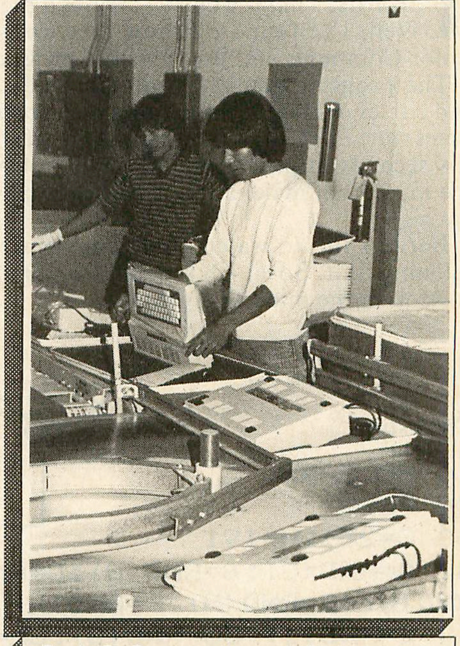
Amazingly, 1.7 million transistors function at the first power up. Some 20 functions are tested and, provided CoCo passes, it's then on to burn-in.

In a brief visit to the burn-in department, we learned that this is probably the most important step in maintaining the highest reliability of the product. This process is to weed out all "infant mortality" of the semi-conductor in the integrated circuit. Even though all of Tandy's semi-conductor suppliers have a similar piece by piece burn-in process in their manufacturing, the CoCo plant repeats the process at the computer manufacturing level.

All sub-assembled, functionally tested P.C. boards are loaded into one of 10 oven chambers for pre-burn-in and then the actual burn-in. During burn-in, boards are kept at both high and low temperatures for 20 hours. After completion of burn-in, every logic board is carefully diagnosed while still heated. We were told that statistics indicate an expected life span of 11 years for the semi-conductors after these conditions in burn-in.

In final assembly, workers combine the logic board, keyboard and power supply and place them inside the case. At this point, each unit is carefully tested for dielectric leakage.

In Quality Control, we are told that the management philosophy is "Do it right the first time," that is, quality cannot be added in Quality Control, but must be installed in the production process. By the time each CoCo reaches this point, it has gone through diagnostic/-functional tests 13 times and has passed 25 detailed inspection gates. But there's more.



Each CoCo goes through 13 tests and inspections before packing.

Prior to packing and shipping, the Quality Assurance department audits on a random sample basis and measures against the Radio Shack acceptance criteria. Because of these many checkpoints, the return ratio of defective units from the field is said to be negligible.

Our last tour stop, naturally enough, was packing and shipping. Packing up Color Computers at a rate of 12 per minute, this department loads the finished product into empty trailers for distribution to Radio Shack warehouses in the U.S., Canada and overseas.

The Tandy Home Computers tour: a RAINBOWfest highlight for all of us who attended, a chance to see what goes inside the Color Computer without even voiding the warranty—a peek and poke Adventure in real time, and real life.

In Quality Assurance, work is audited on a random sample basis and measured against Radio Shack acceptance criteria.

Photos by Bill Kneer and Phil Wolfe, courtesy of Tandy Corporation.

16K
ECB

GENIUS AT WORK

By David C. Wilson

I suppose that all of us have wondered what goes on in an artist's mind when he creates a piece of modern art. Well, I've found out how they do it. They all own a Color Computer and use this little program.

The program generates random lines, boxes, triangles, and circles or elipses. Sometimes they are painted and sometimes not. Each time the program is started (after the first few seconds) it generates a new work of (whew!) art. Also, the music will make a few music masters roll over in their graves.

But, it's fun to watch, and it made my kids giggle a bit listening to it. So sit back, relax, and enjoy a little of what goes on in the mind of a genius.

The listing:

```
120.....00FA
END ...020B
```

```
10 PCLEAR8
20 PCLS
30 G=255:H=191
40 A=RND(G):B=RND(G):C=RND(G):D=
RND(H):E=RND(H):F=RND(H)
50 L=RND(1):CO=RND(8):CL=RND(8):
COL=RND(8):P=RND(4)
60 PMODEP,L:SCREEN1,CO
70 COLORCO,CL
80 LINE(A,D)-(B,F),PSET,B
90 SOUNDA,1
100 COLORCL,CO
110 LINE(C,F)-(A,D),PSET:LINE-(B
,E),PSET:LINE-(C,F),PSET
120 IFP=2THEN230
130 SOUNDB,1
140 A=RND(A):D=RND(D)
150 CIRCLE(A,E),D,COL,CO/3
160 IFP>0THENPAINT(A,E),P+1,COL
170 SOUNDC,1
180 IFP=1THEN200
190 IFP=3THEN200ELSE220
200 LINE(B,F)-(C,D),PSET,BF:GOTO
270
210 SOUNDD,1
220 LINE(B,F)-(C,D),PSET:GOTO260
230 SOUNDE,1
240 PCOPY(COL)TO(CL)
250 GOTO30
260 FORG=1TO(A)STEP20:SOUNDG,1:N
EXT:GOTO280
270 FORG=(C)TO1STEP-20:SOUNDG,1:
NEXT
280 GOTO30
```

(David Wilson is a sheet metal worker and computer hobbyist in Louisville, Ky. He is very interested in computers in education.)

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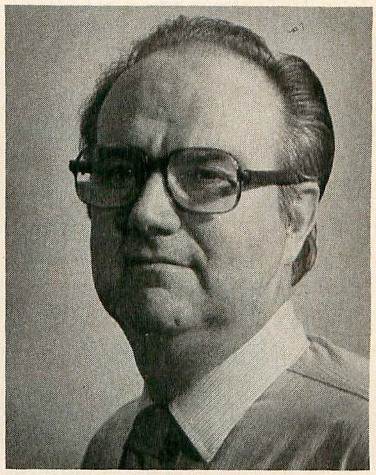

Max Jerman

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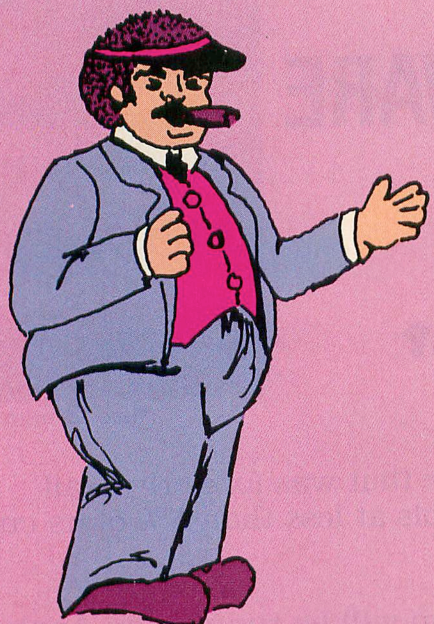

Hi, There! I'm Your Friendly Acey Deucey Dealer

By Barry R. Furman

Acey Deucey is a card game I programmed for the 16K Color Computer without Extended BASIC. It uses the *SET, CHR$,* and *SOUND* commands generously.

A unique part of the game is the talking *Acey Deucey* dealer. The starting graphics showing the dealer is right from Radio Shack's "Getting Started With Color BASIC." (Remember, *"Talking Teacher"*?)

Since the dealer talks, it's necessary for you to record his repertoire on the tape immediately following the *CSAVE.*

First, CSAVE "ACEYDUCY."

Next, place a microphone in the recorder's MIC receptacle (or use condensor mike if included).

Third, type *MOTORON* and press [ENTER].

Immediately, narrate the following to be recorded on the tape:

> HI, THERE! I'M YOUR FRIENDLY ACEY DEUCEY DEALER! ACEY DEUCEY IS PLAYED IN THE FOLLOWING MANNER . . . I WILL DEAL TWO CARDS FACE UP. YOU HAVE THE OPTION TO BET OR NOT TO BET, DEPENDING ON WHETHER OR NOT YOU FEEL THE NEXT CARD WILL HAVE A VALUE BETWEEN THE FIRST TWO CARDS. IF YOU DON'T WANT TO BET, JUST INPUT A ZERO. WHY DON'T YOU PRESS THE LETTER 'C' FOR 'CHICKEN' TO HEAR THE NOISE YOU'RE GOING TO HEAR . . .
>
> (FIVE SECOND PAUSE)
>
> NOW, IF YOU'RE GOING TO WIN THE ROUND, AND I CERTAINLY DOUBT IT, YOU'LL HEAR THIS NOISE . . . PRESS 'W' FOR 'WIN' . . .
>
> (FIVE-SECOND PAUSE)
>
> IF YOU LOSE, AND I CERTAINLY HOPE YOU DO, YOU'LL HEAR THIS NOISE . . . JUST PRESS 'L' FOR 'LOSE' . . .
>
> (FIVE SECOND PAUSE)
>
> OKAY, NOW WE'RE READY TO PLAY THE GAME. CHECK HOW MUCH MONEY YOU HAVE IN YOUR WALLET OR PURSE, AND PLUG IT IN. JUST PRESS 'B' TO BEGIN AND ENTER THE AMOUNT . . .
>
> (THREE-SECOND PAUSE)
>
> SO, YOU WANT TO PLAY ANOTHER GAME AAINST ME, HUH? OK, YOU KNOW WHAT TO DO. JUST PRESS 'B' TO BEGIN AND ENTER HOW MUCH MONEY YOU WANT TO START WITH.
>
> (THREE-SECOND PAUSE)
>
> SO, YOU LOST AGAIN, HUH? . . . AND YOU STILL WANT TO PLAY A THIRD GAME! WELL, OK. JUST PRESS 'B' AND THE AMOUNT OF MONEY YOU WANT TO PLAY WITH.
>
> (THREE SECOND PAUSE)
>
> HEY, I'VE BEATEN YOU THREE TIMES ALREADY! DO YOU STILL WANT TO PLAY? WELL, IF YOU DO, JUST PRESS 'B' AND THEN ENTER THE AMOUNT OF MONEY YOU WANT TO PLAY WITH.
>
> (THREE SECOND PAUSE)
>
> NOW LOOK, I'M GETTING TIRED! THIS IS THE LAST GAME I'M GOING TO PROMPT YOU ON . . . SO PRESS 'B' AND THE AMOUNT OF MONEY, BUT I'M WARNING YOU . . . NEXT TIME IF YOU WANT TO PLAY, YOU'RE GOING TO HAVE A SILENT PARTNER. JUST KEEP REMEMBERING TO PRESS 'B.'

(Barry Furman is a banking assistant vice president who writes programs on his CoCo as a hobby. He plans to start his own software business.)

When finished, rewind the tape and *CLOAD* the program. The *Acey Deucey* dealer appears, and the tape recorder plays back his voice. It is imperative that you keep the casssette recorder's [*PLAY*] key depressed throughout the game. After giving you instructions, the dealer asks you to press "B" to begin and enter your amount of money.

The screen changes to the card table showing three cards face down and your pack of money (with its value). The screen says: "Here's the shuffle," and then you'll hear a card-shuffling sound. Two of the three cards "turn over" to show their faces. The suits of these cards will always be club and spade, but the number values change. (In Color BASIC graphics, it was not possible to make red suits on the buff (white) card face without introducing black in the design. This is because a single quarter of a *SET* mark cannot be independently lit.)

The card values are determined randomly, but for simplicity, I designed it so the first card would always have the lower value of the two, and the two cards would not have the same value, or succeeding values. In a game using actual cards, this would not be the case.

The idea of the game is to bet (whatever amount you want) that the value of the still unturned card falls between the two cards showing. (You may bet up to the value of your current pack of "dough".)

The third card now turns over, showing its face value. The screen also indicates whether you won, lost, bet zero ("chicken!"), bet too much, or lost all your money. Accompanying this will be an appropriate sound. The value of your pack of money is updated accordingly.

If you lose your money, and answer "Y" to the "Play again?" prompt, you'll again be facing the dealer who will have another conversation with you.

The dealer is drawn in Lines 80-390. The *POKE 65495,0* in Line 70 is used to speed up the graphics and accompanying sound. If your computer won't accept this poke, delete that line.

The body of the program (Lines 400-1710) concern the choosing of random numbers, and printing of text on the screen.

The card backs are drawn in Lines 1800-2130. They are turned over in Lines 2140-2410. The third (dealer's) card is turned over in Lines 2420-2770.

Anyone who wishes a copy of this program on tape may send $5 to Barry Furman, 21 Sunset Lane, Levittown, N.Y. 11756. I'll also include an *enhanced* version of Radio Shack's *Blackjack* program listed in "Getting Started With Color BASIC"

190	0193	1530	0AEA
420	0375	1790	0D17
790	0604	2100	0F45
1210	08A6	2480	1187
		END	1336

The listing:

```
10 'acey ducy
20 'BY BARRY FURMAN
30 '21 SUNSET LANE
40 'LEVITTOWN, N.Y. 11756
50 'TEL: (516) 796-5040
60 '
70 POKE65495,0
80 CLS0:N=100:A=0:B=0:C=0:D=0:E=
0:G=0:H=0:I=0:J=0:K=0:L=0:M=0:O=
0:P=0:Q=0:R=0:S=0:T=0:U=0:V=0:W=
0:X=0:Y=0:Z=0
90 FORH=16TO47
100 FORV=4TO23
110 SET(H,V,2)
120 NEXTV,H
130 FORH=0TO63STEP4
140 FORV=24TO31
150 SET(H,V,8):SET(H+1,V,8)
160 SET(H+2,V,7):SET(H+3,V,7)
170 NEXTV,H
180 FORH=26TO35
190 FORV=16TO21
200 SET(H,V,4)
210 NEXTV,H
220 FORV=10TO11
230 SET(24,V,3):SET(25,V,3)
240 SET(36,V,3):SET(37,V,3)
250 NEXTV
260 PRINT@5,"THE ACEY-DUCEY DEAL
ER";
270 IFF>4THENPRINT@304,"REMEMBER
...";:PRINT@338," PRESS 'B' ";
280 IFF>4THEN300
290 MOTORON:AUDIOON
300 O$=INKEY$
310 IFO$="W"THENMOTOROFF:GOSUB26
60
320 IFO$="L"THENMOTOROFF:GOSUB27
00
330 IFO$="C"THENMOTOROFF:GOSUB27
40
340 IFO$="B"THENMOTOROFF
350 IFO$="B"THENF=F+1
360 IFO$=""THEN400
370 IFO$="B"THENPRINT@480,"HOW M
UCH MONEY DO YOU HAVE";:INPUTQ
380 IFQ>0THENMOTOROFF:GOTO430
390 IFO$="B"ANDQ=0THENMOTOROFF:G
OTO430
400 RESET(30,18):RESET(30,19)
410 IFRND(4)=4THENSET(24,10,2):S
ET(37,10,2)
420 GOTO180
430 N=100
```

```
440 CLS0
450 IFQ=0THENQ=100
460 K=K+1:IFK<>1THEN540
470 PRINT@224,"YOU ARE STARTING
WITH"Q"BUCKS";:GOTO590
480 FORX=64TO95
490 PRINT@X,CHR$(128);
500 NEXTX
510 FORX=64TO95
520 PRINT@X,CHR$(128);
530 NEXTX
540 FORX=64TO95:PRINT@X,CHR$(128
);:NEXTX:PRINT@68,"YOU NOW HAVE"
Q"DOLLARS.";
550 PRINT@459,"$";:PRINT@460,Q;
560 FORX=1TO1100
570 NEXTX
580 IFK<>1THEN610
590 FOR J = 1 TO 900
600 NEXTJ
610 GOTO660
620 Q=Q+M
630 GOTO460
640 Q=Q-M
650 GOTO460
660 L=L+1:IFL>1THENN$="NEXT"ELSE
N$="FIRST":GOSUB1690
670 IFL>1THENPRINT@16,"NEXT TWO
CARDS:";
680 A=RND(13)
690 B=RND(13)
700 IF A >= B THEN 680
710 IFB-A=1THEN680
720 GOTO740
730 GOTO640
740 RESTORE
750 DATA1,A,2,2,3,3,4,4,5,5,6,6,
7,7,8,8,9,9,10,10,11,J,12,Q,13,K
,14
760 READG:IFG=14THEN800
770 READC$
780 IF A = G THEN L$ = C$
790 GOTO760
800 RESTORE
810 READ G:IFG=14THEN850
820 READC$
830 IF G = B THEN V$ = C$
840 GOTO810
850 GOSUB1800
860 GOTO870
870 PRINT@288,"WHAT IS YOUR BET"
;:INPUTM
880 FORX=310TO319
890 PRINT@X,CHR$(128);
900 NEXTX
910 IFM<>0THEN1010
920 PRINT@437,"CHICKEN!!!";
930 SOUND21,8:SOUND16,18
940 FORX=288TO319
950 PRINT@X,CHR$(128);
```

```
960 NEXTX
970 FORX=437TO447
980 PRINT@X,CHR$(128);
990 NEXTX
1000 GOTO660
1010 IF M <= Q THEN 1140
1020 T=339:PRINT@T,"SORRY BUT YO
U";:PRINT@T+32,"BET TOO MUCH ";
1030 PRINT@T+64,"YOU HAVE ONLY";
:PRINT@T+96,Q"DOLLARS ";:PRINT@T
+131,"TO BET.";
1040 PRINT@T+161," BET AGAIN ";
1050 FORD=1TO1750
1060 NEXTD
1070 FORX=299TO319
1080 PRINT@X,CHR$(128);:NEXTX
1090 FORG=39TO63
1100 FORJ=18TO31
1110 RESET(G,J)
1120 NEXTJ,G
1130 GOTO860
1140 C=RND(13)
1150 RESTORE
1160 READG
1170 IFG=14THEN960
1180 READC$
1190 IF G = C THEN D$ = C$
1200 GOSUB2420
1210 GOTO1220
1220 IF C > A THEN 1240
1230 GOTO1410
1240 IF C >= B THEN 1410
1250 FORY=1TO8
1260 PRINT@405,"YOU WIN!!!";
1270 SOUND225,5
1280 PRINT@405,CHR$(128);:PRINT@
406,CHR$(128);:PRINT@407,CHR$(12
8);:PRINT@408,CHR$(128);:PRINT@4
09,CHR$(128);:PRINT@410,CHR$(128
);:PRINT@411,CHR$(128);:PRINT@41
2,CHR$(128);
1290 PRINT@413,CHR$(128);:PRINT@
414,CHR$(128);
1300 NEXTY
1310 FORP=300TO319
1320 PRINT@P,CHR$(128);
1330 NEXTP
1340 FORZ=288TO319
1350 PRINT@Z,CHR$(128);
1360 NEXTZ
1370 FORX=405TO415
1380 PRINT@X,CHR$(128);
1390 NEXTX
1400 GOTO620
1410 PRINT@438,"SORRY,";:PRINT@4
69,"YOU LOSE!";
1420 SOUND13,17
1430 FORX=1TO1010
1440 NEXTX
1450 FORY=288TO319
```

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```
1460 PRINT@Y,CHR$(128);
1470 NEXTY
1480 FORX=438TO447
1490 PRINT@X,CHR$(128);
1500 PRINT@X+30,CHR$(128);
1510 NEXTX
1520 IF M < Q THEN640
1530 PRINT
1540 V=307:PRINT@V,"SORRY FRIEND
,";:PRINT@V+34,"YOU LOST";:PRINT
@V+65,"YOUR DOUGH";
1550 PRINT@436,"WANT TO TRY";:PR
INT@468,"AGAIN(Y/N)";:PRINT@505,
"";:INPUTA$
1560 FORX=478TO483
1570 PRINT@X,CHR$(128);
1580 NEXTX
1590 IFA$="Y"THEN80
1600 PRINT@484,"O.K.  HOPE YOU H
AD FUN!!";
1610 FORX=508TO510
1620 PRINT@X,CHR$(128);
1630 NEXTX
1640 GOTO1640
1650 CLS0
1660 FORH=11TO21
1670 FORV=5TO13
1680 SET(H,V,5)
1690 CLS0:PRINT@2,"HERE ARE YOUR
 "N$" TWO CARDS";
1700 PRINT@288,"NEXT CARD";
1710 '***GREEN PILE OF DOUGH***
1720 PRINT@361,"YOUR DOUGH";
1730 FORX=425TO434
1740 PRINT@X,CHR$(143+80);
1750 PRINT@X+32,CHR$(143+80);
1760 PRINT@X+64,CHR$(143+80);
1770 NEXTX
1780 PRINT@459,"$";:PRINT@460,Q;
1790 RETURN
1800 '******BACK OF CARD*******
1810 FORX=64TO96
1820 PRINT@X,CHR$(128);
1830 NEXTX
1840 FORH=10TO21
1850 FORV=7TO15
1860 PRINT@288,"NEXT CARD";
1870 PRINT@69,"HERE'S THE SHUFFL
E...";
1880 SET(H,V,4)
1890 SET(10,V,5):SET(21,V,5)
1900 SET(H+32,V+1,4)
1910 '***
1920 SET(H-6,V+15,4)
1930 SET(42,V+1,5):SET(52,V+1,5)
1940 O=O+1
1950 '***
1960 SET(4,V+15,5):SET(14,V+15,5
)
1970 NEXTV,H
1980 PP=PP+1:IFPP>20THEN2010
1990 SOUND190+PP,1
2000 GOTO1980
2010 PP=0:FORX=101TO106
2020 PRINT@X,CHR$(131+64);
2030 '***
2040 PRINT@X+221,CHR$(131+64);
2050 PRINT@X+160,CHR$(140+64);
2060 '***
2070 PRINT@X+381,CHR$(140+64);
2080 PRINT@X+16,CHR$(131+64);
2090 PRINT@X+176,CHR$(140+64);
2100 '***
2110 NEXTX
2120 FORT=1TO1500
2130 NEXTT
2140 FORH=12TO21
2150 FORV=6TO13
2160 PRINT@65,"NOW I'LL TURN THE
 CARDS OVER...";
2170 SET(H,V+2,5):SET(H+32,V+2,5
)
2180 NEXTV
2190 NEXTH
2200 FORV=7TO12
2210 SET(11,V,5)
2220 SET(21,V,5)
2230 NEXTV
2240 PRINT@200,CHR$(132+64);
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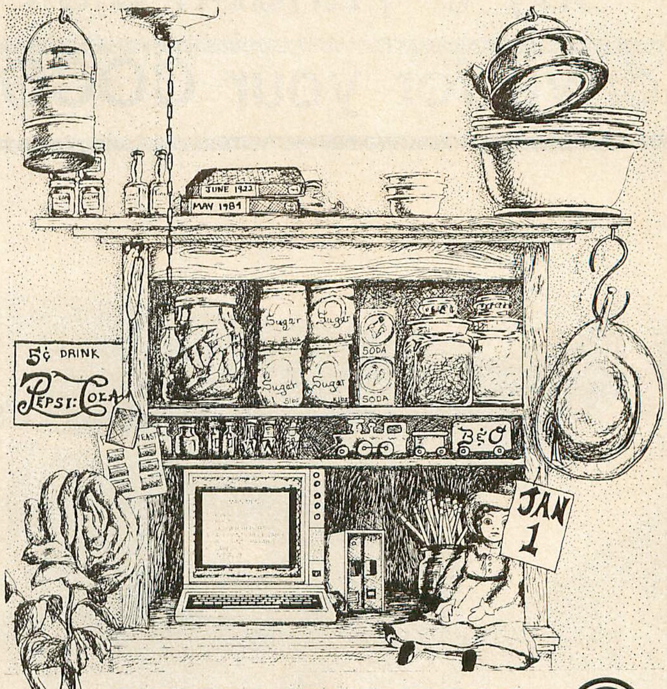

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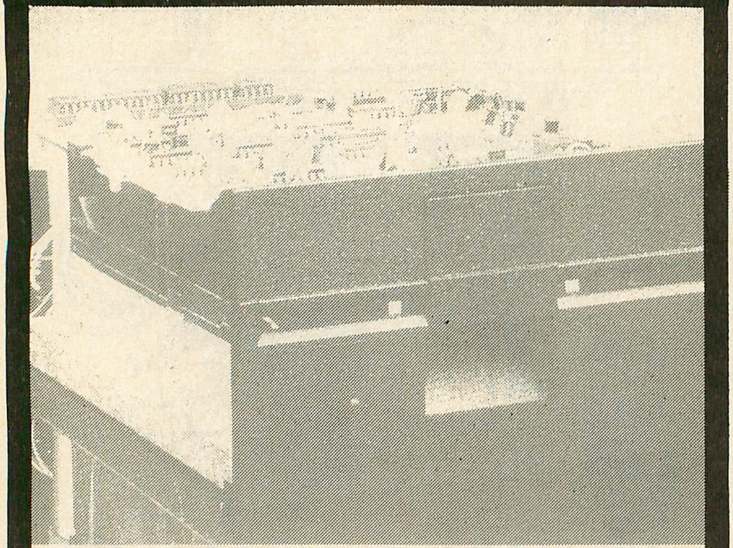

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2260 PRINT@232,CHR$(135+64);
2270 PRINT@215,CHR$(128);
2280 PRINT@216,CHR$(128);
2290 PRINT@217,CHR$(133+64);
2300 PRINT@248,CHR$(135+64);
2310 PRINT@184,CHR$(140+64);
2320 PRINT@183,CHR$(142+64);
2330 PRINT@134,L$;
2340 SOUND90,2
2350 FORJ=1TO1000
2360 NEXTJ
2370 PRINT@150,V$;
2380 SOUND110,1
2390 FORX=1TO1600
2400 NEXTX
2410 RETURN
2420 '**TURN OVER DEALER'S CARD*
*
2430 FORX=1TO1000
2440 NEXTX
2450 FORH=4TO14
2460 FORV=23TO30
2470 SET(H,V,5)
2480 NEXTV,H
2490 PRINT@420,CHR$(128);
2500 PRINT@421,CHR$(128);
2510 PRINT@422,CHR$(133+64);
2520 PRINT@388,CHR$(142+64);
2530 PRINT@389,CHR$(140+64);
2540 PRINT@453,CHR$(135+64);
2550 RESTORE
2560 READG
2570 IFG=14THEN2610
2580 READC$
2590 IF G = C THEN D$ = C$
2600 GOTO2560
2610 FORX=1TO300
2620 NEXTX
2630 PRINT@355,D$;
2640 RETURN
2650 GOTO2650
2660 FORX=1TO4
2670 SOUND 225,5
2680 NEXTX
2690 RETURN
2700 FORX=1TO8
2710 NEXTX
2720 SOUND13,17
2730 RETURN
2740 FORX=1TO8
2750 NEXTX
2760 SOUND21,8:SOUND16,18
2770 RETURN
2780 '************
2790 LINEINPUTA$
2800 PRINT#-2,A$
2810 A$=INKEY$:IFA$=""THEN2810EL
SEMOTOROFF:GOTO2790
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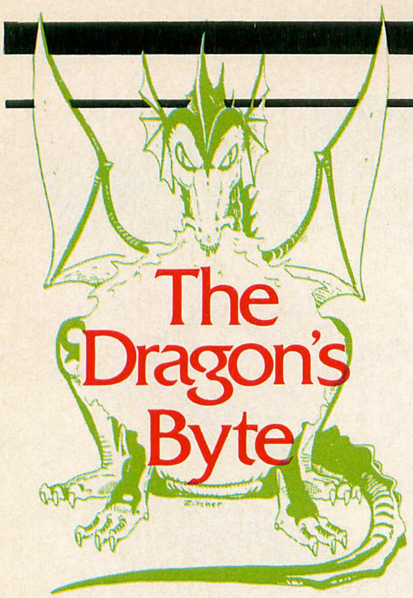

The Benefits Of Role Playing Are No Fantasy

By Bill Nolan
Rainbow Contributing Editor

We recently returned from Rainbowfest in Ft. Worth, Texas, and all of the computer users I spoke with really enjoyed the show. While there, I had the privilege of doing a seminar on the uses of a computer for fantasy gaming, and from the questions and comments I received I think many fantasy game players may be receiving criticism from several quarters concerning their play of the game.

With that in mind, I would like to talk about fantasy gaming, and particularly the benefits of fantasy gaming. Fantasy games are role playing games. In these games the participants act out the roles of one or more characters in an effort to solve various problems or mysteries. In order to play these games properly, all of the people involved must exercise a great deal of imagination and ingenuity, and this increased imagination is sure to carry over into other areas of life.

Some say that the imagination is being used to escape from reality, and I cannot disagree with this. However, I would like to point out that we are escaping from our reality every time we watch a drama or comedy on television, and every time we sit down to read a good novel. The essence of the writer's art is to be able to take the reader or watcher out of themselves for a while and allow them to identify with a different reality. When you finish your book, you can return to your everyday reality refreshed and with a new perspective.

In addition to this, fantasy role playing is not a passive activity, like reading a book or watching a television drama. The participants are creating the story as they go along. It's kind of like deciding you want to read a book—and then writing one so you have one to read.

Another nice thing is the difference between fantasy role playing games and most other games. Nearly all games (whether they are card games like hearts, poker, and old maid; board games like Monopoly, Clue, or Scrabble; computer games like *Viking!* or *Gangbusters;* or athletic games like tennis and football) are contests in which players compete *against each other.* At the end of the game there will be one person or team which wins, and one or several who lose. The lesson of these games is clear: to get ahead you must beat somebody else. To win you must take victory away from other people.

In fantasy role playing games, however, you have a group of players working together toward a common goal. In nearly all cases, you must help your friends to win in order to win yourself, because, in most cases, the entire party of players will win or lose together. The spirit of cooperation fostered by this cannot fail to make the point that in real life it works the same way. If we all pull together toward a common goal, we can all win, but if we work at cross purposes we may all lose.

Aside from these philosophical considerations, there are many practical skills gained while playing fantasy games. First of all, there are many complex records to be maintained, and this skill can be used whenever records are needed. Second, money is always a problem in the game, as in real life, and a player must carefully budget the limited funds so as to cover all expenses. Also, the game will usually involve planning for trips and other operations spanning long periods of time, and supplies such as food must be planned in advance. How much food will you eat in the next month? How will you carry it? If you put it on a pack horse, then how much will the pack horse eat? You get the idea.

The educators I have spoken with tell me that, in most cases, the young people interested in fantasy gaming are among the brightest and best students. They are also far more likely to be interested in computers, and not just so they can play Adventure in Wonderland. They really use the electronic whiz boxes. So, the next time someone gets on your case for wasting your time playing fantasy games, whip out this article and lay it on 'em!

Remember our contest? Last month a contest was announced with two categories. You may remember that we are designing a new fantasy gaming system in this column, and the contest is to design either an original spell or an original monster for the new game. First place in each category will win a $50 gift certificate from Prickly-Pear Software and a $50 gift certificate from Sahuaro Software. Second place in each category will win a $50 gift certificate from Prickly-Pear Software. In addition, each person submitting an entry used in the column will receive a four-color screened Prickly-Pear dragon T-shirt worth $9.95. All entries should be sent to Contest, c/o Bill Nolan, 9234 E. 30th Street, Tucson, Az., 85710. All entries must be received by January 20, 1984, to be eligible, and winners will be announced in the April issue of *Rainbow.* All entries become the property of Bill Nolan.

(Bill Nolan teaches computer science at a local college, referees a weekly fantasy game, and operates Prickly-Pear Software with his wife, Sara.)

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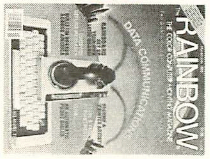

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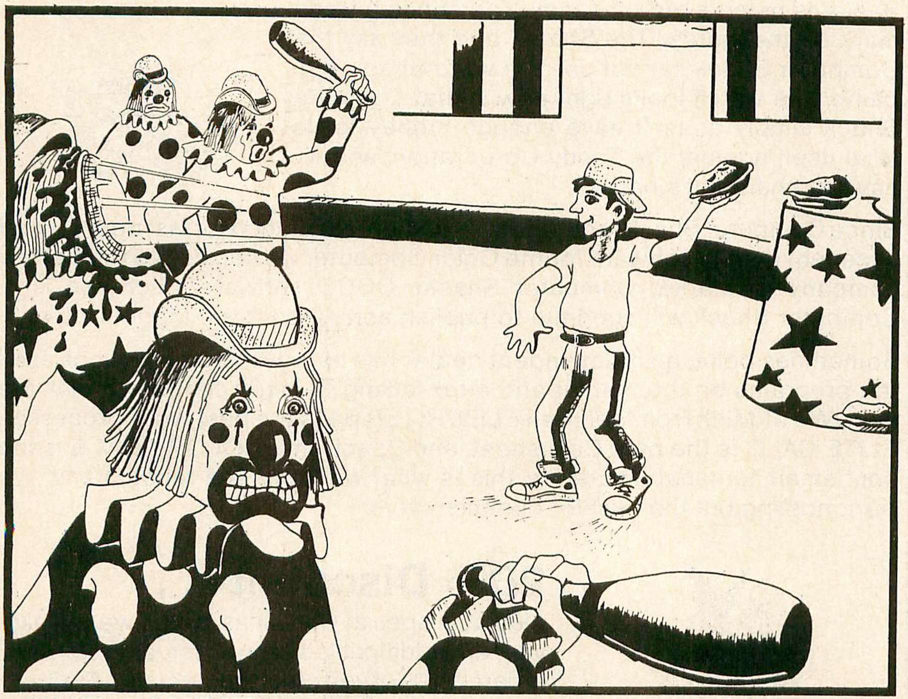

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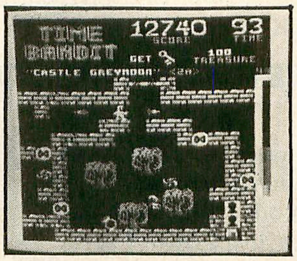
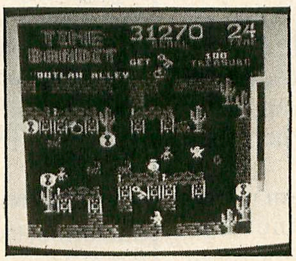
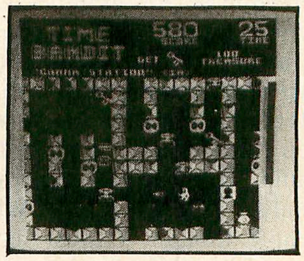
Tired of games that have only a few screens or force you to follow a strict order of levels? In TIME BANDIT, you virtually create you own game! You can choose from more than TWENTY places during the entire game, and each place has more than 15 distinct variations and levels of difficulty; this means over 300 variations in all! You can use the TIMEGATES to travel to three different Worlds of Time, each one containing a multitude of colorful and unique adventuring areas. Visit FANTASY WORLD, WESTERN WORLD, or SPACE WORLD. Avoid or destroy the Evil Guardians: the Watching Lurker, Angry Elmo, Killer Smurphs, and lots more! Find the keys which remove various locks preventing your escape. But hurry Bandit — your power is dwindling and time is fleeting! This new machine language game is so exciting, challenging, and fun that you need never leave your home to find an arcade again! Ultra crisp Supergraphics that include colorful scrolling landscapes and full animation of a multitude of characters, amazing sound, and literally HUNDREDS of screens - it's all here! The conquest of time and space awaits you...



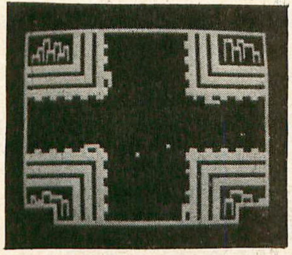
FANTASY WORLD: Conquer the halls of Doom, the Mystic Maze, the Underworld Arena, and other medieval places.

WESTERN WORLD: Visit the Lost Maverick Mine, Dead Man's Pass, (Visit? Escape!) Tombstone Jail, and many more!





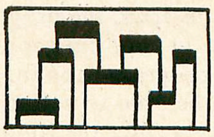
SPACE WORLD: Explore Hyperspace, the bizarre Light Barriers, the Insidious Grid, Gamma Station, the Enterprise and others!



STRONGHOLD

The war was short! Missles were launched, bombs exploded, and civilization was almost entirely whiped out. Only a handful of men remained to help rebuild what was lost. These handful seperated into four different civilizations, each building their own city and shielding it from the radioactive debris that fill the atmosphere. Now the debris has threatened to break up the shielding and destroy civilizations last remainents.

One or two player action with sound and split second graphics. Thats STRONGHOLD, try it and you'll enjoy it!



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Dealers Inquires Invited.

For spells you should specify the name of the spell, materials and time needed to cast it, range, area or number of people affected, effect of the spell, whether saving throws are allow, and what happens if the saving throw is made.

For monsters we need a complete description with a sketch if possible, and the usual stats such as speed, size, attack method, number of attacks, intelligence, special attacks or defenses, and the damage multiplier. As you will recall, the damage multiplier is used to compute damage on our new computer combat system, and for reference a fist is .5 and a long sword is 1.

For both the spells and monsters, the more detailed and original your entry, the better your chance to win. Yes, you can enter in both categories, and yes, more than one entry per category is permitted.

The program I am presenting this month is by popular demand. Several months ago, I did a column about how to do maps of various rooms on the screen in Hi-Res graphics, so when the players enter a room, all you have to do is press the correct number and the appropriate room map is displayed on the screen. I included a few rooms to get you started and suggested that you could put 99 rooms into the program easily in a 16K machine. Well, a lot of people thought I must have already done this and have written asking me to publish all 99 of my rooms, so here they are!

The way you use the program is simple. After typing it in (or loading *Rainbow on Tape*), you can select the room you want by typing the number. You must always type a two digit number, so you would type a 7 as "07." When you type the number, the room map will appear on the screen. The first thing you should do is go through the program looking at each room and drawing a map of it with its number indicated. Then you can create dungeons, castles, towers, and other structures using the rooms from the program. Simply indicate on your dungeon map or key what the program room number is, and you will be able to call it up whenever the players enter the room.

That way, instead of wasting valuable game time describing a complex room, the players will see a map right on the TV screen. Don't limit yourself by assuming that north is always at the top, either. You can simply say "north is at the left" or whatever and use each room in four different orientations. By combining these rooms in various ways, you can create thousands of different maps.

MichTron is our new corporate identity. Computer Shack is being sued by Tandy. Tandy has a trademark on the words "The Shack" and they say that, Computer Shack cannot use the word Shack in its name. The way it looks right now is that Computer Shack simply doesn't have enough money to defend itself against the Tandy Corporation, and will have to change it's name.

Since Computer Shack is getting an excellent reputation for fast delivery and excellent quality software for the Color Computer we decided to form a new company to market Computer Shacks COCO software. MichTron is it. Computer Shack will continue to publish software for the Model I/III/4.

Sometimes being an independent dealer has its advantages. We look at all the programs on the market and after talking to many people we pick the best. We at MichTron feel the TELEWRITER 64 is the best word processor, ELITE CALC is the best Calc sheet, and Spectrum's COLOR COM E is the best smart terminal. Therefore this is what we carry and recommend. We want nothing but the best for our customers.

20% Discount . . .

Also as a special Christmas bonus we will give you an additional discount for any software ordered. 10% if you order 2 programs, 15% if you order 3 programs and 20% if you order 4 or more programs. (Only one discount per order and YOU MUST ASK for the discount when placing the order!)

TOP TEN FOR THE MONTH OF DECEMBER

#1 CASHMAN **Computer Shack**
A great original game for the COCO! A combination of Jumpman and Bagman with many totally original concepts specially designed for the COCO. Excellent one player game. Unbelievably fun to play with 2 players simultaneously.
TAPE/DISK $27.95/29.95

#2 DEMON SEED **Comp Shack**
Somewhat like the game Phoenix. 3 different waves of demons and bats attack you. Plus you have challenge rounds! Great graphics and fast action.
TAPE/DISK.............. (27.95/29.95)

#3 TIME BANDIT **Comp Shack**
Another game written for the COCO this is an original game. The closest arcade game is Tutenkham to which it has a very loose resemblance. Great color and super fun to play. ($27.95/29.95)

# 4 LUNAR PATROL **Spectral**
This is an exact copy of the arcade game Moon Patrol. Excellent graphics.
TAPE/DISK............. $24.95/28.95)

# 5 LANCER **Spectral**
This is a copy of the arcade game Joust. Excellent graphics and playability.
TAPE/DISK .... ($24.95/28.95)

# 6 FURY **Computer Shack**
A very loose copy of the arcade game Time Pilot. Excellent color, very fast.
TAPE/DISK $27.95/29.95

# 7 OUTHOUSE **Computer Shack**
A totally new outrageously funny game only available on the COCO.
TAPE/DISK $27.95/29.95

# 8 CHOPPER STRIKE **C.S.**
A combination of Scramble, Whirlybird Run and Chopper. Great action and graphics.
TAPE/DISK $27.95/29.95

# 9 THE KING **Tom Mix**
A copy of the arcade game Donkey Kong. Very good graphics. ($26.95/29.95)

# 10 MUDPIES **Computer Shack**
An original game by the authors of Demon Seed. Excellent graphics and its super fun to play. One of our favorites! ($27.95/29.95)

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ASSEMBLY LANGUAGE GRAPHICS FOR THE TRS-80 COLOR COMPUTER

By Don Inman **$14.95**

Written specifically for the TRS-80 Color Computer, this book uses sound and graphics to show how 6809 assembly language can be used to perform tasks that would be difficult or impossible with BASIC. All of the explanations are hands-on, so that the manual can serve as a tutorial.

PROGRAMMING THE 6809

By Zaks & Labiak **$14.95**

This book explains how to program the 6809 in assembly language, covering all aspects progressively and systematically. Begining with the basics of programming, **Programming the 6809** goes on to explain registers and buses, subroutines, the 6809 instruction set, addressing modes, I/O techniques and devices, and finally, data structures.

THE FACTS

By Spectral Associates **$14.95**

The facts is a compendium of data designed to explain in detail the internal workings of the Color Computer. A must for any machine language or basic programmer.

TRS-80 COLOR COMPUTER GRAPHICS

By Don Inman **$14.95**

Explore the creative and imaginative blending of computers and color using Color Computer Graphics. This book will enable you to explore all the graphics capabilities of Extended Basic. The book also provides application programs and useful subroutines. 303 pages.

PASCAL - A Problem Solving Approach

By Elliot Koffman **$14.95**

Here is everything you need to know about problem solving and structured programming in Pascal.

INTRODUCTION TO PASCAL

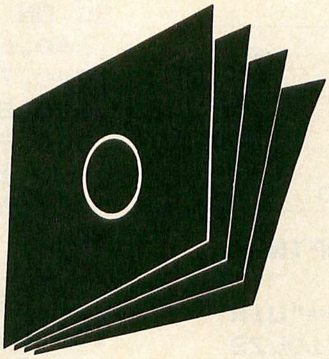
By Rodney Zaks **$14.95**

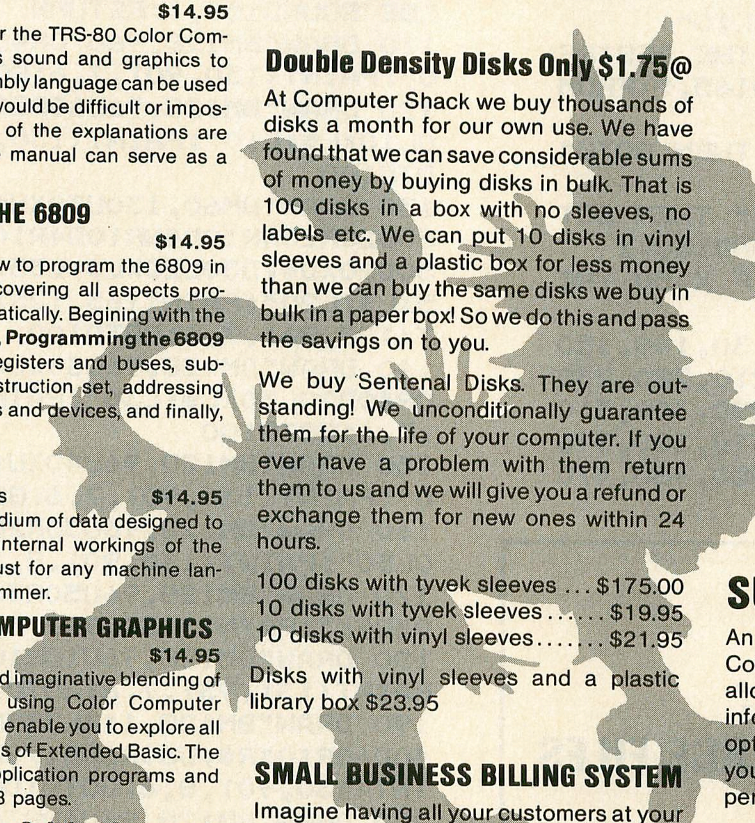
Without question the best organized and the most clearly written of the many introductory Pascal books.

BLANK COMPUTER TAPES

Same high quality AMPEX tape we use for our own products.

10 min	.50
20 min	.60
30 min	.65





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At Computer Shack we buy thousands of disks a month for our own use. We have found that we can save considerable sums of money by buying disks in bulk. That is 100 disks in a box with no sleeves, no labels etc. We can put 10 disks in vinyl sleeves and a plastic box for less money than we can buy the same disks we buy in bulk in a paper box! So we do this and pass the savings on to you.

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SMALL BUSINESS BILLING SYSTEM

Imagine having all your customers at your finger tips with the ability to print invoices or monthly bills easily and quickly. Now imagine being able to keep a running total of all customer accounts without having to even pick up a calculator. Its all automatic, just say so and it performs. you can access a customer file, print a invoice, add sales tax, shipping cost, interest, and even service charges with the simple ease of pushing a button. All at once you'll have time to get the important things done instead of constantly worrying about customer accounts. That's what you get with a BILLING SYSTEM. Computer Shack's Small Business Billing System, not an elaborate accounts receivable program, but a simple and effective way of keeping track of people who owe you money.

DISK OR TAPE $29.95

C III

This program lets you copy a Color Computer disk file (any file: basic, text or machine language) to a Model I/III or 4 disk or from a Model I/III or 4 to a Color Computer disk. This program does no conversions but it will transfer any file to or from a disk. You must have a Model I/III or 4 with 2 disk drives (Model I must be double density). Compatible with most Model I/III operating systems.

Price is $24.95 for the Model I/III or 4 disk.

SUPERZAP

An amazing new program for the serious Color Computer disk user. This program allows the user full access to all of the information on any disk. With 17 menu options, this user-friendly program takes you step by step through the functions it performs.

SUPERZAP has a main screen menu that tells you all the options and their corresponding keys. All you do is decide what you need done and the program does the rest. Disk backups, copy sectors, erase tracks, granule maps, kill and list files, modify sectors in HEX or ASCII, and more!

No more lost time because of disk problems. SUPERZAP can do it! The ultimate in disk repair and information retieval. No color computer disk operator should be without it.

DISK ONLY...................... $29.95

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Complete kit of 64K chips with instructions for their use. Now only **$44.95.**

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Dealers Inquires Invited.

Next month we will get back to the new game, so keep those entries coming in, and watch out for dragons!

70	021A	650	1261
150	04A5	730	1560
280	07E3	810	1791
360	0A7F	900	1A79
450	0D42	980	1CA8
550	1002	END	1F61

The listing:

```
10 '(C)1982 PRICKLY-PEAR SOFTWAR
E
20 U$="L1U10R3D10L2BU10":R$="U1R
10D3L10U2BR10":D$="L1D10R3U10L2B
D10":L$="D2L10U3R10D1BL10"
30 CLS3:PRINT@98,"HIT THE DESIRE
D ROOM NUMBER";:PRINT@165,"(FROM
 '01' TO '99')";
40 X$=INKEY$:IF X$="" THEN GOTO4
0 ELSE SOUND150,1
50 XX$=INKEY$:IF XX$="" THEN GOT
050 ELSE X$=X$+XX$:SOUND150,1
60 X=VAL(X$):GOSUB90:IF X>50 THE
N X=X-50:GOTO80
70 ON X GOSUB110,120,130,140,150
,160,170,180,190,200,210,220,230
,240,250,260,270,280,290,300,310
,320,330,340,350,360,370,380,390
,400,410,420,430,440,450,460,470
,480,490,500,510,520,530,540,550
,560,570,580,590,600:GOTO30
80 ON X GOSUB610,620,630,640,650
,660,670,680,690,700,710,720,730
,740,750,760,770,780,790,800,810
,820,830,840,850,860,870,880,890
,900,920,930,940,950,960,970,980
,990,1000,1010,1020,1030,1040,10
50,1060,1070,1080,1090,1100:GOTO
30
90 PMODE3,1:PCLS:SCREEN1,0:COLOR
6,5:RETURN
100 K$=INKEY$:IF K$="" THEN100 E
LSE SOUND150,1:RETURN
110 DRAW"BM128,96U70R40XD$;D60L4
0":PAINT(130,90),7,6:GOTO100
120 DRAW"BM128,96U60R30D20XD$;D3
0L10XL$;L10":PAINT(130,90),7,6:G
OTO100
130 DRAW"BM60,130U30XU$;U20R50NR
50D20R20NR10D4NR10D4R10U8R20U20R
50D20XD$;D30L20XL$;L35XL$;XL$;L3
5XL$;L20":PAINT(65,125),8,6:PAIN
T(128,86),7,6:GOTO100
140 DRAW"BM128,96U30XU$;U20R50D4
0R40D20L50XL$;L30":PAINT(130,90)
,7,6:GOTO100
150 DRAW"BM128,96U40XU$;R40D50L4
0":PAINT(130,90),7,6:GOTO100
160 DRAW"BM128,96U30R20XR$;R20D3
0L50":PAINT(130,90),8,6:GOTO100
170 DRAW"BM128,96U50R30D120L30U6
0XU$;":PAINT(130,90),8,6:GOTO100
180 DRAW"BM128,96U10R10D10XL$;":
PAINT(131,93),7,6:GOTO100
190 DRAW"BM128,114L35XL$;L25U90R
40D40R10XR$;U60R60D170L50U60":PA
INT(130,90),8,6:GOTO100
200 DRAW"BM128,96U60R30D60L10XL$
;L10":PAINT(130,90),7,6:GOTO100
210 DRAW"BM128,96U15XU$;U15R30D4
0L30":PAINT(130,90),7,6:GOTO100
220 DRAW"BM128,96U10XR$;D10XL$;"
:PAINT(131,91),8,6:GOTO100
230 DRAW"BM128,96U30R50D10XD$;D1
0L50":PAINT(130,90),7,6:GOTO100
240 DRAW"BM128,96U40R25XR$;R35D1
10L30XL$;L30U40R50U10XU$;U10L50"
:PAINT(130,90),8,6:GOTO100
250 DRAW"BM60,120U21NR10C8U2R10D
3C6R10NR20U50R60D50L20D20L60":CI
RCLE(95,67),8:CIRCLE(125,87),8:P
AINT(62,118),8,6:PAINT(95,67),7,
6:PAINT(125,87),7,6:GOTO100
260 DRAW"BM128,96U35R30D80L30U35
XU$;":PAINT(130,90),8,6:GOTO100
270 DRAW"BM128,96U30R5XR$;XR$;R5
D30L30":PAINT(130,90),8,6:GOTO10
0
280 DRAW"BM128,96U20R20D20L5XL$;
```

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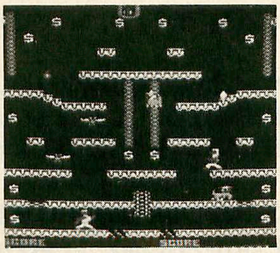
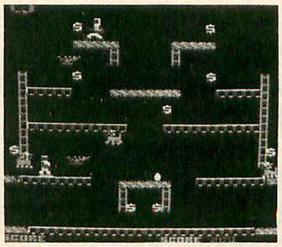
CASHMAN

By Doug Frayer and Bill Dunlevy

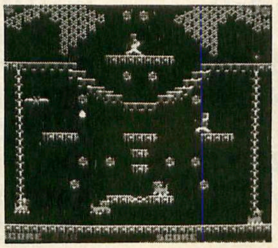




The screen is exploding with colorful, fast moving animation like you've never seen. The speaker is alive with every kink of sound imaginable! Best of all, the players eyes are glowing with fascination and wonder of this classic creation. THE GAME??? CASHMAN! So colorful, so imaginative, so all out fun, that you'll wonder why you ever settled for anything less!.

Dozens of levels and screens (more than FORTY!) let anyone from beginner to expert have as much excitement, challenge, and good clean fun as they can stand! Even the least adept player can have the time of their life with CASHMAN, yet with the increased excitement of special MYSTERY PIECES and EXPERT PUZZLE screens, the most experienced arcade addict is guaranteed to never stop playing!!!

Play by yourself or invite the ultimate hallenge of simultaneous two player competition! Run along the colorful girders, jump across the tremendous chasms, climb the wobbly ladders, or grab a BYRD and fly to get the loot before your opponent does! Be careful though, KATS are on the prowl and wrestling with them can be a challenge.



CASHMAN's classical play is the originality and the fun that no arcader whether a veteran or a rookie can afford to pass up. So run, jump, climb, or fly to the nearest color computer and play the ultimate.... CASHMAN!

32K COLOR COMPUTER
TAPE..... $27.95 DISK..... $29.95

All software in stock will be shipped within 24 hours. Plus we will give you 20% OFF if you order 4 or more software packages. 15% OFF on 3 and 10% discount on 2 software packages.

Listed below is a partial list of the programs we carry. We carry only what we think is the best available software. Prices are listed (tape/disk). We guarantee satisfaction. If any product does not perform as advertised return it, and we will gladly exchange it for you. Please note that we carry some items not on this price list.

Astro Blast (Mark Data)	**17.47/20.97**
Balloon Attack (Computer Shack)	**21.95/23.95**
Bloc Head (Computerware)	**26.95/29.95**
Cashman (Computer Shack)	**27.95/29.95**
Catalyst (Computer Shack)	**21.95/23.95**
Chopper Strike (Computer Shack)	**27.95/29.95**
Color Demon Seed (Computer Shack)	**27.95/29.95**
Color DFT (Computer Shack)	**25.95/25.95**
Color Fury (Computer Shack)	**27.95/29.95**
Colorcom/E (Spectrum)	**44.95/44.95**
Colorpede (Intracolor)	**29.95/34.95**
Color Graphics Editor (Softsector)	**9.98**
Color Time Bandit (Computer Shack)	**27.95/29.95**
Color Stronghold (Computer Shack)	**27.95/29.95**
Color Billing System (Computer Shack)	**29.95**
Composer (Speech Systems)	**19.95/25.95**
Cosmic Clones (Mark Data)	**19.95/24.95**
Cubix (Spectral Associates)	**24.98/28.98**
Devil Assault (Tom Mix)	**27.95/30.95**
Disk To (Tom Mix)	**17.95**
Doodle Bug (Computerware)	**26.95/29.95**
Dunkey Monkey (Intelitronics)	**9.95/12.95**
Editor Assembler (Micro Works)	**89.95/99.95**
Elite Calc (Elite Software)	**49.75/49.75**
Frog (Tom Mix)	**27.95/30.95**
Galagon (Spectral)	**24.95/28.95**
Ghost Gobbler (Spectral)	**24.95/28.95**
Glaxxons (Mark Data)	**17.47/20.97**
Intercept 4 (Computer Shack)	**27.95/29.95**
Invaders Revenge (Med Systems)	**11.97**
Junior's Revenge (Computerware)	**28.95/31.95**
King (Tom Mix)	**26.95/29.95**
Lancer (Spectral Assoc.)	**24.95/28.95**
Lunar Rover Patrol (Spectral Assoc.)	**24.95/28.95**
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Moon Shuttle (Datasoft)	**31.95**
Ms. Gobbler (Spectral)	**24.95/28.95**
Mudpies (Computer Shack)	**27.95/29.95**
Ninja Warrior (Programmers Guild)	**14.98**
Omni Clone (Prickly Pear)	**29.95**
Outhouse (Computer Shack)	**27.95/29.95**
Pacdroids (Programmers Guild)	**9.98**
Phantom Slayer (Med Systems)	**11.97**
Planet Invasion (Spectal Assoc.)	**24.95/28.95**
Pooyan (Datasoft)	**26.20**
Robottack (Intracolor)	**24.95/27.95**
Shark Treasure (Computerware)	**17.95/22.95**
Speak Up (Classical)	**19.95**
Tape To Disk (Tom Mix)	**17.95**
Telewriter 64 (Cognitec)	**44.95/49.95**
Trapfall (Tom Mix)	**27.95/30.95**
Zap (Computer Shack)	**29.95**
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```
L5":PAINT(131,91),8,6:GOTO100
290 DRAW"BM60,100U20R30XR$;R30D1
0R50D10L70XL$;XL$;L30":PAINT(62,
97),7,6:GOTO100
300 DRAW"BM60,100U90R30XR$;XR$;R
70D90L120":CIRCLE(130,60),35:PAI
NT(62,98),8,6:PAINT(130,60),7,6:
GOTO100
310 DRAW"BM128,96D10L10NU10L4NU1
0L4NU10L4NU10L4NU10L4U10NR20U10R
10U20XR$;D20BL10XR$;R10D10XL$;":
GOTO100
320 DRAW"BM60,100U10NU30R10U30L1
0U10R40ND50R5ND50R5ND50R5ND50R5N
D50R5ND50R5ND50R120D20XD$;D20L55
XL$;L25XL$;XL$;L80":PAINT(62,98)
,7,6:PAINT(62,80),8,6:PAINT(160,
62),7,6:GOTO100
330 DRAW"BM128,96U20XU$;U20R50D5
0L20XL$;L20":PAINT(130,90),8,6:G
OTO100
340 DRAW"BM60,140U10XU$;U10R50U6
0R80D10XD$;D10L50D60L80":PAINT(6
5,135),7,6:GOTO100
350 DRAW"BM128,96U70R25XR$;R25D7
0L25XL$:L25":PAINT(130,90),7,6:G
OTO100
360 DRAW"BM128,96U70R40XR$;R20D7
0L70":PAINT(130,90),8,6:GOTO100
370 DRAW"BM128,96U60R25XR$;R25D6
0L15XL$;L35":PAINT(130,90),7,6:G
OTO100
380 DRAW"BM40,160U150R110D150L50
XL$;L50":PAINT(128,96),8,6:GOTO1
00
390 DRAW"BM128,96L5ND10L5ND10L5N
D10L5ND10L5ND10L5ND10XL$;BD10NR4
0U15XU$;U5R10XR$;XR$;R10D5XD$;D1
5":GOTO100
400 DRAW"BM60,130U120R15XR$;R15D
90R50D70XL$;U60L50D20L30":PAINT(
62,110),7,6:GOTO100
410 DRAW"BM60,120U95R70XR$;D95L8
0U10R70U70L40NL30BD10L20D50R50U5
0L30BD10L10D30R30U30L20BD10D10R1
0U10L10":PAINT(62,118),8,6:PAINT
(62,102),6,6:PAINT(72,93),7,6:PA
INT(82,82),6,6:PAINT(92,72),7,6:
GOTO100
420 DRAW"BM128,96U60R40D20XD$;D3
0L40":PAINT(130,90),8,6:GOTO100
430 DRAW"BM128,96U35XU$;U35R40D8
0L15XL$;L15":PAINT(130,90),8,6:G
OTO100
440 DRAW"BM128,96U20R30U20R50D60
L50U20L30":PAINT(130,90),7,6:GOT
O100
450 DRAW"BM128,96U55R30D20R50XR$
;D35L90":PAINT(130,90),8,6:GOTO1
00
460 DRAW"BM128,96U25XU$;U25R25XR
$;R25D25XD$;D25L60":PAINT(130,90
),8,6:GOTO100
470 DRAW"BM88,156U100R100D40XD$;
D50L100":PAINT(94,146),7,6:GOTO1
00
480 DRAW"BM100,120U60R60D60L25XL
$;L25":PAINT(112,110),7,6:GOTO10
0
490 DRAW"BM60,96U50R100D100L50U1
0XU$;U30L50":PAINT(63,92),8,6:GO
TO100
500 DRAW"BM130,100U40R20XR$;R10D
50L50U10R10":PAINT(133,102),7,6:
GOTO100
510 DRAW"BM60,150XU$;U90R50D50R5
0U20XU$;U1XU$;U9R50D100L150U1":P
AINT(67,140),8,6:GOTO100
520 DRAW"BM120,96U10BU10U10R30D2
0XD$;D10L40U10L20U20R30":PAINT(1
27,90),8,6:GOTO100
530 DRAW"BM100,116U20XU$;U20R10X
R$;R10XR$;R10D10XD$;D10XD$;D10L1
0XL$;L10XL$;L10":PAINT(102,113),
7,6:GOTO100
540 DRAW"BM100,96U20XU$;U10R10XR
$;R10D10XD$;D20R10D10L20XL$;L10U
10":PAINT(102,90),8,6:GOTO100
550 DRAW"BM128,96U20R5XR$;R5D20L
```

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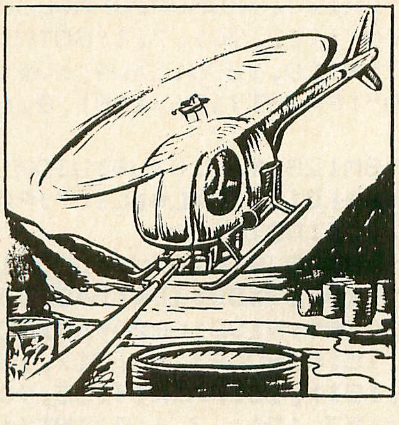
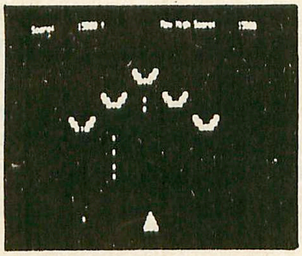


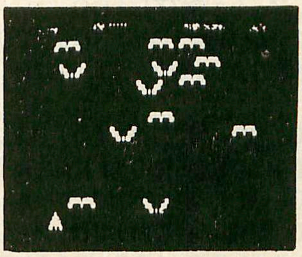
CHOPPER STRIKE

The patter of the blades, the roar of the engine, and the scream of the wind against the glass can be heard as you slowly move your chopper toward enemy terrain. Your mission — SEARCH AND DESTROY. Find enemy outpost, missle site, gun turrets, and oil tanks and then, using your own guns, destroy them. Help to rescue your own men, trapped behind enemy lines. Most of all, SURVIVE against fantastic odds.

Below are your targets! Look over there! An enemy oil tank, filled with fuel. Take the chopper low, watch your gun sights, as the tank comes into view, FIRE! In a blaze of color, the tank errupts upon the screen! But watch out, right over the cliff is an enamy gun turret just waiting for you to pass. Jam the stick inot the upper corner and avoid its deadly barrage. Line it up in your gun sights and return the blast. Got it! But next time will you be so lucky? Ground missles, ICBM's, and unstopable heat seeker's are just a few of the obstacles you'll encounter. Survival won't be easy, but then, *nothing worth while ever is!*

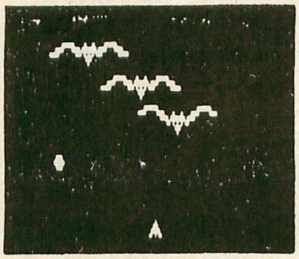
Two great fast moving, machine language versions: 32K COLOR COMPUTER, with over 180 different screens and 16K COLOR COMPUTER with all the thrills, color and excitment of the 32K verison, but with fewer screens. (Both versions are included in each package). CHOPPER STRIKE, you'll have to experience it, to believe it! TAPE .... $27.95 DISK $29.95

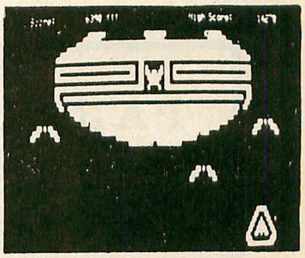




DEMON SEED

By Jeffrey Sorensen and Philip MacKenzie





The end is near; the demonic forces have invaded our galaxy. It is up to you to defend the galaxy from destruction. At your command is a powerful star cruiser equipped with high-energy missiles and defensive shields. Only with practice and patience will you be able to defeat the many waves of demon attacks and reach the three special challenge levels that will test your mental and physical dexterity.

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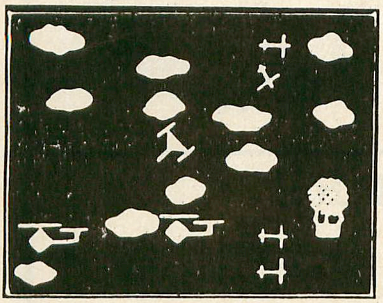

COLOR FURY

by Tim Purves

The skys the limit in this action packed, airborne, dog fight simulation. All alone, you're surrounded by enemy fighters. Dodge behind a cloud and come out shooting! You'll be passed by paratroopers and tri-fighter forces. Destroy'em all, and don't spare the ammo. This is a life and death stuggle with only one victor!!!

The battle takes place in the air! The enemy attacks with everything they've got, airplanes, helicopters, hot air balloons, paratroopers and magnetic air mines.

COLOR FURY has the action and all out fun that you've come to expect from the industries leading TRS-80 software publisher. 16K or 32K

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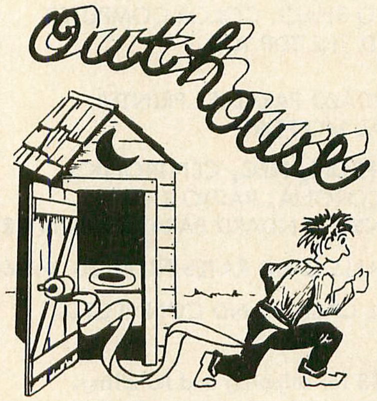

COLOR OUTHOUSE

Computer Shack presents the wildest, funniest, all out originalist niest, all out originalest game ever published for the TRS-80 Color Computer, Color Outhouse. In this filled arcade game you must guard your outhouse against a band of notorious toilet paper thieves. And if that isn't enough, we've got some of the craziest vandals you've ever seen. Bright colorful graphics, wonderful sound (very descriptive), and most of all, a lot of fast and furious fun. This will most definitely be one to show your friends!!!

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5XL$;L5":PAINT(131,91),7,6:GOTO1
00
560 DRAW"BM100,120U25XU$;U25F30G
30":PAINT(102,110),8,6:GOTO100
570 DRAW"BM60,96U30XU$;U30R20F70
L90":PAINT(67,90),8,6:GOTO100
580 DRAW"BM120,96E25F25L20XL$;L2
0":PAINT(124,94),7,6:GOTO100
590 DRAW"BM120,96U10XU$;U10F60L1
0XL$;L10H30":PAINT(122,90),7,6:G
OTO100
600 DRAW"BM120,96U10R30H10L10U5R
40D20XD$;D5L50XU$;":PAINT(122,93
),8,6:GOTO100
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0R10XR$;D10L60":PAINT(122,90),7,
6:GOTO100
620 DRAW"BM110,148U45XU$;U45E30R
10XR$;D120R10F10L70":PAINT(112,5
0),7,6:GOTO100
630 DRAW"BM130,120U25XU$;XU$;U25
G36F35":PAINT(128,116),8,6:GOTO1
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640 DRAW"BM110,96U15XU$;U15R60D1
0XD$;D20L60":PAINT(112,90),7,6:G
OTO100
650 DRAW"BM120,96U10XU$;U30F60L2
5XL$;L25U10":PAINT(122,90),8,6:G
OTO100
660 DRAW"BM120,96U50R20F50L30XL$
;L30":PAINT(122,90),7,6:GOTO100
670 DRAW"BM120,120U15XU$;XU$;U15
R50D50L50":PAINT(126,118),8,6:GO
TO100
680 DRAW"BM128,96U10XU$;U10R10XR
$;R10D10XD$;D10L10XL$;L10":PAINT
(135,92),7,6:GOTO100
690 DRAW"BM128,96U20XU$;U20R10XR
$;R10XR$;R10D39XD$;XD$;D40L80XL$
;L10U60R10XR$;R10D10R20":CIRCLE(
153,121),15:CIRCLE(153,71),15:CI
RCLE(103,121),15:PAINT(135,90),8
,6:PAINT(153,121),7,6:PAINT(153,
71),7,6:PAINT(103,121),7,6:GOTO1
00
700 DRAW"BM128,96U75R30D150L30U6
5L10D50L10XL$;L10U90R10XR$;R10D3
0R10":PAINT(135,90),8,6:GOTO100
710 DRAW"BM128,96U30XR$;R20D40XL
$;U10L20":PAINT(135,90),7,6:GOTO
100
720 DRAW"BM60,100U50R100D40XD$;X
D$;D40L100U50":FORB=70TO150STEP2
0:FOR C=140TO60STEP-20:CIRCLE(B,
C),5:NEXT C:NEXT B:PAINT(65,95),
8,6:GOTO100
730 DRAW"BM60,146U50XU$;XU$;U40R
30U20R10XR$;R10D50R30U20R10XR$;R
```

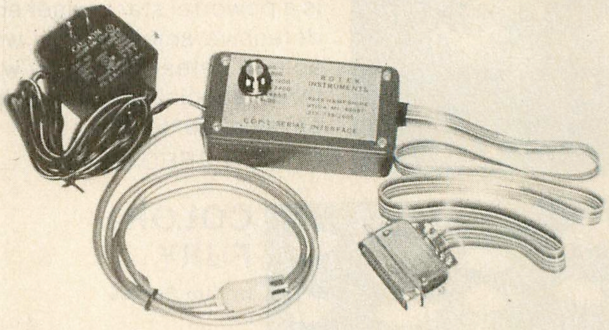

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10D50L30U20L30D70L60":CIRCLE(90,
116),20:PAINT(65,140),8,6:PAINT(
90,116),7,6:GOTO100
740 DRAW"BM60,96U30R10U30F50R20U
40R60D80L25XL$;L25U30L5XL$;L5D40
L60U10XU$;U20":CIRCLE(88,96),10,
6,2:PAINT(88,96),7,6:PAINT(63,96
),8,6:GOTO100
750 DRAW"BM118,106U30R10XR$;R10D
30L10XL$;L10":PAINT(124,96),7,6:
GOTO100
760 DRAW"BM108,116U15XU$;U15R15X
R$;R15D15XD$;D15L15XL$;L15":PAIN
T(112,106),8,6:GOTO100
770 DRAW"BM108,116U40R15XR$;R15D
40L15XL$;L15":PAINT(112,106),7,6
:GOTO100
780 DRAW"BM108,116U15XU$;U15R40D
40L40":PAINT(112,106),8,6:GOTO10
0
790 DRAW"BM100,120U50R20XR$;R20D
50L20XL$;L20":PAINT(110,110),7,6
:GOTO100
800 DRAW"BM100,120U50R50D50L20XL
$;L20":PAINT(110,110),8,6:GOTO10
0
810 CIRCLE(128,96),15:DRAW"BM123
,110XR$;":PAINT(128,96),7,6:GOTO
100
820 CIRCLE(128,96),50:DRAW"BM123
,145XR$;":PAINT(128,96),8,6:GOTO
100
830 CIRCLE(128,96),30:DRAW"BM123
,125XR$;":PAINT(128,96),7,6:GOTO
100
840 CIRCLE(128,96),25:CIRCLE(128
,96),50:DRAW"BM123,145XR$;":PAIN
T(128,96),7,6:PAINT(128,140),8,6
:GOTO100
850 DRAW"BM80,110U10XU$;U10E30R1
0XR$;R10F30D10XD$;D10G30L10XL$;L
10H30":PAINT(128,96),7,6:GOTO100
860 DRAW"BM80,110U10XU$;U10E30R3
0F30D30G30L30H30":PAINT(128,96),
8,6:GOTO100
870 DRAW"BM114,120U50R30D50L30":
PAINT(128,96),7,6:GOTO100
880 DRAW"BM128,140H30U10XU$;U10E
30F30D10XD$;D10G30":PAINT(128,96
),8,6:GOTO100
890 DRAW"BM80,146U45XU$;U45R100D
45XD$;D45L40XL$;XL$;L40":PAINT(1
28,96),7,6:GOTO100
900 DRAW"BM50,180U20NR160U20NR16
0U20NR160U20NR160U20NR160U20NR16
0U20NR160U20R20ND160R20ND160R20N
D160R10XR$;ND160XR$;R10ND160R20N
D160R20ND160R20D160L70XL$;XL$;L7
```

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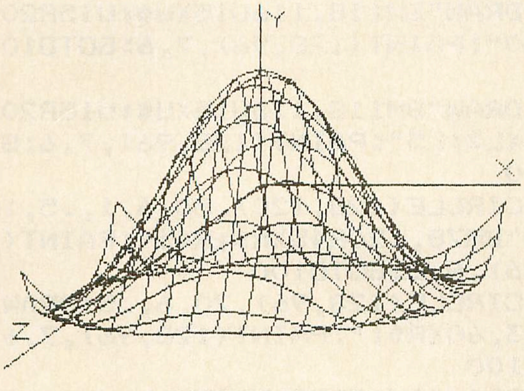

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```
0":FOR X=60TO180STEP40:FOR Y=30T
O150STEP40:PAINT(X,Y),8,6:NEXT Y
:NEXT X
910 FOR X=80TO200STEP40:FOR Y=50
TO170STEP40:PAINT(X,Y),8,6:NEXT
Y:NEXT X:FOR X=60TO180STEP40:FOR
Y=50TO170STEP40:PAINT(X,Y),7,6:N
EXT Y:NEXT X:FOR X=80TO200STEP40
:FOR Y=30TO150STEP40:PAINT(X,Y),
7,6:NEXT Y:NEXT X:GOTO100
920 DRAW"BM90,140U55XU$;U55F120L
55XL$;L55":PAINT(110,100),7,6:GO
TO100
930 DRAW"BM128,96H30R60F30L25XL$
;L25":PAINT(132,92),8,6:GOTO100
940 DRAW"BM90,120E60R35XR$;R35G6
0L35XL$;L35":PAINT(128,96),8,6:G
OTO100
950 DRAW"BM60,120E60R55XR$;R55G6
0L55XL$;L55":PAINT(128,96),7,6:G
OTO100
960 DRAW"BM70,120E40R60F40L60XL$
;XL$;L60":PAINT(128,96),8,6:GOTO
100
970 DRAW"BM30,120E70R20XR$;R20F7
0L190":PAINT(128,96),7,6:GOTO100
980 DRAW"BM80,116E40R5XR$;R5F40L
100":PAINT(128,96),8,6:GOTO100
990 DRAW"BM128,96U30R20D30L5XL$;
L5":PAINT(131,92),7,6:GOTO100
1000 DRAW"BM128,96U10XU$;U10R20D
30L20":PAINT(131,92),8,6:GOTO100
1010 DRAW"BM118,116U40R20D40L5XL
$;L5":PAINT(128,96),8,6:GOTO100
1020 DRAW"BM118,116U15XU$;U15R20
D40L20":PAINT(128,96),7,6:GOTO10
0
1030 DRAW"BM118,116U15XU$;U15R20
D40L5XL$;L5":PAINT(128,96),7,6:G
OTO100
1040 CIRCLE(128,120),50,6,1,.5,1
:DRAW"BM78,120R45XR$;R45":PAINT(
128,96),8,6:GOTO100
1050 CIRCLE(128,96),70,6,.5:DRAW
"BM123,60XR$;":PAINT(128,96),7,6
:GOTO100
1060 DRAW"BM128,96U20F20L5XL$;L5
":PAINT(131,93),8,6:GOTO100
1070 DRAW"BM128,96U5XU$;U15F30L3
0":PAINT(131,93),7,6:GOTO100
1080 DRAW"BM90,116U15XU$;U15R40F
40L35XL$;L35":PAINT(128,96),8,6:
GOTO100
1090 DRAW"BM90,76U5XU$;U5R80D80L
5XL$;L5U60L60":PAINT(98,70),7,6:
GOTO100
1100 DRAW"BM70,60R10XR$;R10F30E3
0R10XR$;R10G60H60":PAINT(80,65),
8,6:GOTO100
```

VIP™

Library

ANNOUNCING The VIP Library™ With a Terrific Sale!

Nelson Software Systems is now Softlaw Corporation, under new management. Our Super "Color" Library programs have also undergone a name change. All programs are the same unbeatable Super "Color" Library programs you've heard so much about, but with new VIP names. To introduce our **VIP Library** we are having a special sale on the following pages. Our low prices for such high quality can't be beat so get started today!

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All **Library** programs are written in machine code specifically for the Color Computer, to work without the interference of a separate operating system such as FLEX. From this comes speed and more work-space for you. **Library** programs work perfectly with every Color Computer, from 16 to 64K. The most advanced hardware and software techniques are used to place programs in rompak cartridges for instant loading and total workspace with any Color Computer.

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The programs do not depend on BASIC, and so allow total compatibility and workspace with any size Color Computer, even 64K. Unlike other programs for the Color Computer which are said to be 64K compatible, **VIP Library**™ programs are not limited to between 24 and 30K of workspace in 64K. **Library** programs have Memory Sense with BANK SWITCHING to fully use all 64K, thus giving an astounding 61K of workspace with the rompak cartridge, and up to 51K with a disk version!

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> *". . . PICTURE getting your instantaneous investment report over the phone, using it in your spreadsheet calculation, generating a report, and writing a memo including that report and data from your database with your word processor, and all this with VIP Library™ programs . . ."*

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The Library Programs

For your writing needs is the **VIP Writer**™, and its spelling checker, the **VIP Speller**™. For financial planning and mathematical calculations you can use the **VIP Calc**™. To manage your information and send multiple mailings there is the **VIP Database**™. For sending all these files to and from home or the office and for talking to your friends you can have the **VIP Terminal**™. Finally, to fix disks to keep all your **Library** files in good repair we offer the **VIP Disk-ZAP**™.

Mini Disk Operating System

The Disk versions each have a Mini Disk Operating System which will masterfully handle from 1 to 4 drives. It offers smooth operation for such features as the ability to read a directory, display free space on the disk, kill files, save and automatically verify files, and load, rename and append files. **Library** programs simply do not have the limitations of BASIC.

Professionalism

The **Library** comes handsomely bound in gold-embossed, padded leatherette binders to grace your work area with the professionalism it deserves. Welcome the **VIP Library**™ into your home and office.

A description of each of the **Library** programs, with the special sale price, is contained in the following pages. Please indulge!

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VIP Writer™

(Formerly Super "Color" Writer II)
By Tim Nelson

**RATED TOPS IN RAINBOW, HOT COCO,
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The Official Dragon Microcomputer Word Processor†**

The most powerful and easy-to-use word processor is available in the showpiece and workhorse of the **Library: The VIP Writer™**. Because of its undisputed superiority over all Color Computer word processors, it was selected by Dragon Data Ltd. of England to be the Official Word Processor for its line of Dragon microcomputers.

The result of two years of research, the **VIP Writer™** offers every feature you could desire from a word processor. It is the most powerful, fastest, most dependable and most versatile. With the display, workspace and compatibility features built into the **Library** the **Writer** is also the most usable.

". . . Nearly every feature and option possible to implement on the Color Computer. The design of the program is excellent; the programming is flawless . . . Features for the professional, yet it is easy enough for newcomers to master . . . Certainly one of the best word processors available for any computer . . ." October 1983 "Rainbow"

The **Writer** will work with you and your printer to do things you always wanted to do. Every feature of your printer can be put to use, every character set, every graphics capability at any baud rate, EVEN PROPORTIONAL SPACING. All this with simplicity and elegance.

Although all versions feature tape save and load, the disk version provides the Mini Disk Operating System common to the whole **Library**, plus disk file linking for continous printing.

Professional features of particular note:

- Memory-Sense with **BANK SWITCHING** to fully utilize 64K, giving not just 24 or 30K, but up to 61K of workspace with the rompak version and 50K with the disk version.
- TRUE FORMAT WINDOW to EXACTLY replicate the printed page ON THE SCREEN BEFORE PRINTING, showing centered line headers, FOOTNOTES, page breaks, page numbers, & margins in line lengths of up to 240 characters. It makes HYPHENATION a snap.
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- The ability to control ANY PRINTER, using dynamic text formatting with 27 comprehensive format parameters.
- Automatic justification, automatic pagination, automatic centering, automatic flush right, underlining, superscripts, subscripts, pause print, single-sheet pause, and print comments.
- Type-ahead, typamatic key repeat and key beep for the pros, ERROR DETECTION and UNDO MISTAKE features, 3 PROGRAM-MABLE functions, auto phrase insert, column creation, an instant HELP TABLE, and a 110 page, fully indexed tutorial.

16K ROMPAK $59.95 **32K DISK $59.95**

†Sold as the Dragon Writer™ ONLY by Dragon Data Ltd. and its distributors.

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While They Last $49.95**

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(Formerly Super "Color" Speller)

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VIP Library™

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By Kevin Herrboldt

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Both versions feature Tape save and load, but the disk version also has the Mini Disk Operating System of the entire **Library**.

32K (comes with tape and disk) $59.95

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(Formerly Super "Color" Terminal)

THE FINEST TERMINAL PROGRAM ANYWHERE!

By Dan Nelson

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Picture getting your instantaneous investment report, incorporating it in your spreadsheet calculation, generating a report, and writing a memo incorporating that report and data from your database, all with **Library** programs. Then you can transmit the report to work, or wherever, long distance. The **VIP Terminal™** will become the hub of your **Library.**

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All versions allow tape load and save of files and KSMs, but the disk version also has the Mini Disk Operating System common to the **Library.**

16K ROMPAK $49.95 **16K DISK $49.95**

Disk version requires 32K for lowercase displays.

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(Formerly Super "Color" Database)

INCLUDES MAIL MERGE CAPABILITIES TOO!

By Tim Nelson

This high speed MACHINE LANGUAGE program fills all your information management needs, be they for your business or home. And it does so better than any other database program for the Color Computer, featuring machine code, lowercase screens and mailmerge capabilities. Inventory, accounts, mailing lists, family histories, you name it, the **VIP Database™** will keep track of all your data, and it will sort and merge **VIP Writer™** files.

The **VIP Database™** features the **Library** Memory Sense with BANK SWITCHING and selectable lowercase displays for maximum utility. It will handle as many records as fit on your disk or disks. It is structured in a simple and easy to understand menu system with full prompting for easy operation. Your data is stored in records of your own design, each divided into up to 255 fields. Each field will hold up to 255 characters. All files are fully indexed for speed and efficiency. Full sort of records is provided for easy listing of names, figures, addresses, etc., in ascending or descending alphabetic or numeric order. You may also combine files, sort and print mailing lists, print "boiler plate" documents, automatically insert text in standardized forms, address envelopes - the list is endless. The math package even performs arithmetic operations and updates other fields. Create files compatible with the **VIP Writer™** and **VIP Terminal™**. Up to five different print formats are available, and control codes may be imbedded for use with all printers.

As with all other **Library** programs, the **Database** features the powerful Mini Disk Operating System.

32K DISK $59.95

VIP Disk-ZAP™

(Formerly Super "Color" Disk-ZAP)

RAVED ABOUT IN THE APRIL 1983 "RAINBOW!"

By Tim Nelson

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16K DISK $49.95

Lowercase displays not available with this program.

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DISK UTILITY

16K
DISK
BASIC

The Limousine Utility: A Tape To Disk Transfer Vehicle

By Roger Schrag

When lots of folks first get a Color Computer, they hook up a cassette recorder to save their programs on, figuring they will get a disk drive later on. By the time they do get a disk drive, they have accumulated a large library of program and data files on tape.

It then becomes something of a chore to transfer all of those files from tape to disk. A BASIC program needs to be *CLOADed* from tape and *SAVEd* to disk. A machine language program needs to be *CLOADMed* from tape, analyzed so that the addresses may be found, and finally *SAVEMed* to disk. Transferring data files, meanwhile, can often be a total nightmare.

What I would like to present here is a simple tape to disk file transferring utility. The source code is shown in the program listing, and may be keyed in and assembled with most any Editor/Assembler in a straightforward manner.

In short, this utility will read just about any standard tape file and transfer it to disk. The disk file will have the exact same attributes (BASIC or machine language, ASCII or binary, etc.) as the tape file, and the disk file will be fully loadable and operational.

To transfer a file from tape to disk, load the assembled program and execute it. The screen will clear and you will be prompted to prepare the cassette containing the file to be transferred and to press [ENTER]. Cue the tape to the beginning of the file and press [ENTER]. The tape's sound will be played over the TV's speaker to aid you in locating the recording on the cassette. If you cue the tape badly and the tape starts out in the middle of the file, don't worry; simply reposition the tape to the beginning. The transfer utility will sift patiently through the middle of a file, or even through garbage, until it finds what it's looking for.

When the transfer utility does find the beginning of a file, it will stop the recorder and print the file's name and type. You will be asked if you wish to transfer this file. If you do, press the Y key. Otherwise press the N key. You will be prompted to prepare the cassette again.

As the file loads in, a block will blink in the upper left corner of the screen. If there isn't enough memory to hold the whole file, or if there is an I/O error, a message will be printed and the transfer terminated. You will then be invited to start the transfer utility over again or return to BASIC.

BASIC programs saved in non-ASCII form and machine language programs saved with the *CSAVEM* command are organized differently on disk than on tape. So when the tape file is fully loaded into memory, the transfer utility will automatically reformat the data as needed so that it will work correctly on disk. (BASIC programs saved in ASCII form, data files, and machine language programs created by *EDTASM+* don't need any modifying.)

When the tape file is finished loading and reformatting is complete, a message to this effect will appear on the screen. You will now be asked for the name you wish to give to the disk file. Enter any filespec that is valid in BASIC but *don't enclose it in quotes.* If you don't specify an extension, none will be used, and if you don't specify a drive number, the default will be used.

The transfer utility will next save the file onto disk. If an error occurs anywhere along the way, a message will be printed and you will be prompted again to enter the name for the disk file. So, if an error occurs while saving to disk, you won't have to reload the tape file all over again.

When the file has been successfully saved on disk, you will be asked if you would like to start the transfer utility anew. If you have more tape files to transfer, then press the Y key. Pressing the N key will return you to BASIC.

At any time the transfer utility is waiting for keyboard input, you may press [BREAK] to cancel the transfer in progress. You will then be asked if you would like to start over again or return to BASIC.

This utility will transfer any BASIC program, BASIC program saved in ASCII, machine language program created by *CSAVEM,* machine language program created by *EDTASM+*, or just about any data file to disk easily and accurately. It very well may not transfer protected programs or automatic execute loaders.

One interesting note: On cassette, there is no distinction between data files and BASIC programs saved in ASCII. That is, there is no way to tell whether a file was created with the command *OPEN*"O",-1"NAME" or with the command *CSAVE* "NAME",A. What does this mean? If you use the utility to transfer a BASIC program saved in ASCII, you will be told that the file is a data file, even though it is actually a BASIC program. There is no harm in this, however, because

---

(Roger Schrag, currently studying computer science at the University of California at Berkeley, enjoys working with CoCo and writing articles for ***the Rainbow.*** *He also designs and translates programs for Adventure International.)*

the disk file created will load correctly with the *LOAD* command, in spite of being labeled as a data file.

All files created by the Color Computer start out with a 15-byte block of data called a *Header*. The Header contains the filename, the file's type, whether it is in ASCII or binary, and whether the tape recorder must be turned off and back on between loading each block of code. This leaves four bytes which are usually unused. The one exception is in machine language programs saved by the *CSAVEM* command. Here, the last four bytes contain the program's start and execute addresses. The transfer utility uses all of the information in a file's header to load it properly and reformat it if necessary. Some of this information is then transferred into the disk directory.

This utility uses three undocumented routines in the disk ROM. It checks to see which version of the disk ROM you have, and then branches to the appropriate address.

That about rounds out The Tape to Disk File Transfer Utility. If you have any questions or comments, feel free to drop me a line. If you'd like, you may purchase the source code on cassette for $5. My address appears at the top of the program listing.

The listing:

```
                  00001 ******************************
                  00002 * TAPE TO DISK FILE TRANSFER *
                  00003 ******************************
                  00004 *
                  00005 *By:
                  00006 *  Roger Schrag
                  00007 *  2054 Manning Avenue
                  00008 *  Los Angeles, CA 90025
                  00009 *
                  00010 *
1000              00011         ORG     $1000   Low area of memory
1000 10CE 1000    00012 START   LDS     #$1000  Set up stack
1004 86   7E      00013         LDA     #$7E    Opcode for JMP nn
1006 8E   11B2    00014         LDX     #ERROR  Address to JMP to
1009 B7   018E    00015         STA     $18E    Patch into Basic's
100C BF   018F    00016         STX     $18F    Error vector
100F 8E   1460    00017         LDX     #BUFFER Start of free memory
1012 A6   84      00018 MLOOP   LDA     ,X      Read a byte
1014 43           00019         COMA            Complement register
1015 63   84      00020         COM     ,X      Complement RAM
1017 A1   84      00021         CMPA    ,X      Is the RAM good?
1019 26   04      00022         BNE     GOTMEM  If not,stop the test
101B 63   80      00023         COM     ,X+     Restore byte and go
101D 20   F3      00024         BRA     MLOOP   Check more bytes
101F 30   89 FF00 00025 GOTMEM  LEAX    -$100,X Lower pointer some
1023 BF   143C    00026         STX     TOPMEM  Set top of memory
1026 10CE 1000    00027 BEGIN   LDS     #$1000  Reset stack pointer
102A 86   60      00028         LDA     #$60    Blank on the screen
102C 8E   0400    00029         LDX     #$400   Top of screen
102F 9F   88      00030         STX     $88     Place cursor there
1031 A7   80      00031 CLS     STA     ,X+     Clear the screen
1033 8C   0600    00032         CMPX    #$600   One byte at a time
1036 25   F9      00033         BLO     CLS     ...
1038 5F           00034         CLRB            Use ROM routine to
1039 BD   A99D    00035         JSR     $A99D   Activate tape AUDIO
103C 8E   128F    00036         LDX     #TITLE  Title message
103F BD   11F1    00037         JSR     PRINTM  Print the message
1042 BD   11F9    00038         JSR     INPUT   Wait for Enter key
1045 7F   0985    00039         CLR     $985    Shut off drives so
1048 7F   0986    00040         CLR     $986    They won't run endlessly
104B 7F   FF40    00041         CLR     $FF40   During cassette I/O
104E AD   9F A004 00042 GETHED  JSR     [$A004] Locate new recording
1052 8E   1450    00043         LDX     #HEADER Tell ROM to read data
1055 9F   7E      00044         STX     $7E     Into HEADER buffer
1057 AD   9F A006 00045         JSR     [$A006] Read some data
105B 0D   7C      00046         TST     $7C     Was it a file header?
105D 26   EF      00047         BNE     GETHED  Try again if not
105F 0D   81      00048         TST     $81     Was there an IO error?
1061 26   EB      00049         BNE     GETHED  Try again if so
1063 BD   11DE    00050         JSR     MTROFF  Shut off tape motor
```

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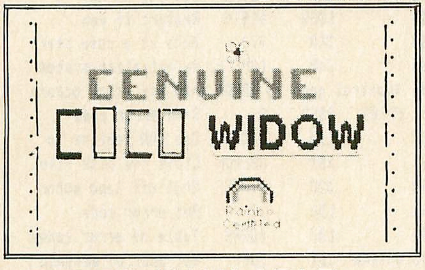

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```
1066 8E   04A0     00051        LDX    #$4A0   Set cursor position
1069 9F   88       00052        STX    $88     At mid screen
106B 8E   12E1     00053        LDX    #TNAME  "Filename is..."
106E BD   11F1     00054        JSR    PRINTM  Print the message
1071 8E   1450     00055        LDX    #HEADER Point to filename
1074 C6   08       00056        LDB    #$8     8 characters long
1076 A6   80       00057 PNAME  LDA    ,X+     Get character
1078 BD   11E7     00058        JSR    VIDEO   Print on screen
107B 5A            00059        DECB           Decrement counter
107C 26   F8       00060        BNE    PNAME   Print whole name
107E 8E   12F4     00061        LDX    #TTYPE  "It is a..."
1081 BD   11F1     00062        JSR    PRINTM  Print the message
1084 8E   1287     00063        LDX    #TTYPES Table of types
1087 B6   1458     00064        LDA    HEADER+8 Get file's type
108A 81   02       00065        CMPA   #$2     Is it legal?
108C 23   02       00066        BLS    OKTYPE  Skip ahead if so
108E 86   03       00067        LDA    #$3     It's "Non standard"
1090 48            00068 OKTYPE LSLA           Type times two
1091 AE   86       00069        LDX    A,X     Get addr off table
1093 BD   11F1     00070        JSR    PRINTM  Print the message
1096 8E   133D     00071        LDX    #XFERIT "Transfer it?"
1099 BD   1224     00072        JSR    YESNO   Get yes or no
109C 26   88       00073        BNE    BEGIN   If no, try again
109E 8E   1460     00074        LDX    #BUFFER Start of memory
10A1 20   05       00075        BRA    SYNC    Jump into load loop
10A3 7D   145A     00076 TLOAD  TST    HEADER+$0A Need to resyncronize?
10A6 27   0B       00077        BEQ    NOSYNC  Skip routine if not
10A8 34   10       00078 SYNC   PSHS   X       Save X
10AA BD   11DE     00079        JSR    MTROFF  Turn off tape motor
10AD AD   9F A004  00080        JSR    [$A004] Resyncronize
10B1 35   10       00081        PULS   X       Restore X
10B3 9F   7E       00082 NOSYNC STX    $7E     Tell ROM where to put data
10B5 AD   9F A006  00083        JSR    [$A006] Load some data
10B9 C6   01       00084        LDB    #$1     Code for I/O ERROR
10BB 0D   81       00085        TST    $81     Was there an IO?
10BD 1026 00F1     00086        LBNE   ERROR   Branch if so
10C1 96   7C       00087        LDA    $7C     Check block's type
10C3 81   FF       00088        CMPA   #$FF    End of the file?
10C5 27   0F       00089        BEQ    TAPEND  Skip ahead if so
10C7 4A            00090        DECA           Valid data block?
10C8 1026 00E6     00091        LBNE   ERROR   I/O ERROR if not
10CC BC   143C     00092        CMPX   TOPMEM  Out of buffer space?
10CF 25   D2       00093        BLO    TLOAD   Loop back if not
10D1 C6   FF       00094        LDB    #$FF    Code for BUFFER FULL
10D3 7E   11B2     00095        JMP    ERROR   Cause the error
10D6 BF   143E     00096 TAPEND STX    EOF     Save the file's end
10D9 BD   11DE     00097        JSR    MTROFF  Shut off tape motor
10DC B6   1458     00098        LDA    HEADER+8 Get file's type
10DF 81   02       00099        CMPA   #$2     Was it M.L. program?
10E1 26   2F       00100        BNE    NOTML   Skip ahead if not
10E3 7D   145A     00101        TST    HEADER+$0A In CSAVEM form?
10E6 26   2A       00102        BNE    NOTML   Skip ahead if not
                   00103 *Tape files created by CSAVEM must be edited
                   00104 *before they will load properly from disk
10E8 30   0A       00105        LEAX   $0A,X   Change EOF to make
10EA BF   143E     00106        STX    EOF     File 10 bytes longer
10ED FC   145B     00107        LDD    HEADER+$0B Get EXEC address
10F0 ED   83       00108        STD    ,--X    Put it at very end
10F2 6F   82       00109        CLR    ,-X     Preceed EXEC address
10F4 6F   82       00110        CLR    ,-X     By two zeroes
10F6 86   FF       00111        LDA    #$FF    Preceed all that by
10F8 A7   82       00112        STA    ,-X     An $FF
10FA A6   1A       00113 FIX1   LDA    -6,X    Move the entire file
10FC A7   82       00114        STA    ,-X     Over five bytes. This
10FE 8C   1465     00115        CMPX   #BUFFER+5 Leaves five bytes
1101 22   F7       00116        BHI    FIX1    At the very beginning
1103 FC   145D     00117        LDD    HEADER+$0D Get START address
1106 ED   83       00118        STD    ,--X    Add it into file
1108 FC   143E     00119        LDD    EOF     Get length of file
110B 83   146A     00120        SUBD   #BUFFER+$0A Minus 10
110E ED   83       00121        STD    ,--X    Add this into file
1110 6F   82       00122        CLR    ,-X     Make first byte zero
1112 7D   1458     00123 NOTML  TST    HEADER+8 Is it Basic program?
1115 26   1D       00124        BNE    NOTBAS  Skip ahead if not
                   00125 *Non ASCII Basic prorams also must be edited
1117 BE   143E     00126        LDX    EOF     Change end of file
111A 30   03       00127        LEAX   3,X     To make the file
111C BF   143E     00128        STX    EOF     Three bytes longer
111F A6   1C       00129 FIX2   LDA    -4,X    Move entire file
1121 A7   82       00130        STA    ,-X     Over three bytes, so
```

```
1123 8C   1463     00131        CMPX   #BUFFER+3 The three extra bytes
1126 22   F7       00132        BHI    FIX2    Are at the beginning
1128 FC   143E     00133        LDD    EOF     Get length of file
112B 83   1463     00134        SUBD   #BUFFER+3 Minus three
112E ED   83       00135        STD    ,--X    Add it into file
1130 86   FF       00136        LDA    #$FF    Make very first byte
1132 A7   82       00137        STA    ,-X     Of file an $FF
1134 8E   0520     00138 NOTBAS LDX    #$520   Set cursor position
1137 9F   88       00139        STX    $88     At mid screen
1139 8E   1353     00140        LDX    #LDCOMP "Load is complete"
113C BD   11F1     00141        JSR    PRINTM  Print the message
113F 8E   1368     00142 RETRY  LDX    #DNAME  "Disk filename?"
1142 BD   11F1     00143        JSR    PRINTM  Print the message
1145 BD   11F9     00144        JSR    INPUT   Get the filename
1148 BE   1458     00145        LDX    HEADER+8 Get file's type
114B BF   0957     00146        STX    $957    Store it
114E B6   095A     00147        LDA    $95A    Get default drive #
1151 97   EB       00148        STA    $EB     Store it
1153 8E   094C     00149        LDX    #$94C   Clear out the
1156 86   20       00150        LDA    #$20    Filename storage
1158 A7   80       00151 BLANK  STA    ,X+     Area
115A 8C   0957     00152        CMPX   #$957   ...
115D 25   F9       00153        BLO    BLANK   ...
115F 8E   1440     00154        LDX    #INKEY  Name person entered
1162 C6   FF       00155        LDB    #$FF    Prepare B
1164 5C            00156 GETLEN INCB           Get the length of
1165 6D   85       00157        TST    B,X     The person's entry
1167 26   FB       00158        BNE    GETLEN  Into B
1169 CE   1176     00159        LDU    #BACK   Put return address
116C 34   40       00160        PSHS   U       Onto stack
116E 6F   E2       00161        CLR    ,-S     Make space on stack
1170 CE   127B     00162        LDU    #DFNAME Use ROM routine to
1173 7E   126D     00163        JMP    USEROM  Prepare the filename
1176 86   4F       00164 BACK   LDA    #$4F    ASCII O for Output
1178 C6   01       00165        LDB    #$1     Use device #1 (disk)
117A CE   127F     00166        LDU    #DOPEN  Use ROM routine to
117D BD   126D     00167        JSR    USEROM  Open the file
1180 8E   1460     00168        LDX    #BUFFER Start of memory
1183 86   01       00169        LDA    #$1     Select output device
1185 97   6F       00170        STA    $6F     #1 (the disk file)
1187 A6   80       00171 DWRITE LDA    ,X+     Get a byte
1189 34   10       00172        PSHS   X       Save X
118B AD   9F A002  00173        JSR    [$A002] Write it to file
118F 35   10       00174        PULS   X       Restore X
1191 BC   143E     00175        CMPX   EOF     More to write?
1194 25   F1       00176        BLO    DWRITE  Skip back if so
1196 CE   1283     00177        LDU    #DCLOSE Use ROM routine to
1199 BD   126D     00178        JSR    USEROM  Close the disk file
119C 8E   1379     00179        LDX    #ALDONE "Transfer complete"
119F BD   11F1     00180 FINISH JSR    PRINTM  Print the message
11A2 8E   13C4     00181        LDX    #AGAIN  "Start program anew?"
11A5 BD   1224     00182        JSR    YESNO   Get yes or no
11A8 1027 FE7A     00183        LBEQ   BEGIN   Restart if yes
11AC 0F   71       00184        CLR    $71     Make it a cold start
11AE 6E   9F FFFE  00185        JMP    [$FFFE] Reinitialize system
                   00186 *Control goes to ERROR when any error occurs
11B2 34   04       00187 ERROR  PSHS   B       Save error code
11B4 CE   1283     00188        LDU    #DCLOSE Use ROM routine to
11B7 BD   126D     00189        JSR    USEROM  Close the disk file
11BA 8D   22       00190        BSR    MTROFF  Shut off tape motor
11BC E6   E4       00191        LDB    ,S      Get error code
11BE CE   13D9     00192        LDU    #ERRS   Table of error codes
11C1 AE   C1       00193 GETERR LDX    ,U++    Get addr of message
11C3 E1   C4       00194        CMPB   ,U      Compare codes
11C5 27   04       00195        BEQ    GOTERR  Skip ahead if match
11C7 6D   C0       00196        TST    ,U+     End of table?
11C9 26   F6       00197        BNE    GETERR  Skip back if not
11CB BD   11F1     00198 GOTERR JSR    PRINTM  Print error message
11CE 35   04       00199        PULS   B       Restore error code
11D0 8E   1399     00200        LDX    #CANCEL "Function cancelled"
11D3 C1   01       00201        CMPB   #$1     Cancel procedure if
11D5 27   C8       00202        BEQ    FINISH  Error occurred while
11D7 C1   FF       00203        CMPB   #$FF    Loading the tape file
11D9 27   C4       00204        BEQ    FINISH  But if file loaded OK,
11DB 7E   113F     00205        JMP    RETRY   Then ask again for filename
11DE B6   FF21     00206 MTROFF LDA    $FF21   Shut off tape motor
11E1 84   F7       00207        ANDA   #$F7    Reset the bit in PIA
11E3 B7   FF21     00208        STA    $FF21   Store it in PIA
11E6 39            00209 RETURN RTS            Return
11E7 34   16       00210 VIDEO  PSHS   X,D     Save X and D
```

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```
                    SUMMARY REPORT AS OF 12/31/83

---------------------------------------------------------------------------

      JAN   FEB   MAR   APR   MAY   JUN   JUL   AUG   SEP   OCT   NOV   DEC

AU     15    50    13     0    18    57     0     6     0     0     0     0
BU    250     0   167   456     0     0     0     0     0     0     0     0
CC    245   200   280   240   330   310   300   335   325   253   375   115
CI    238   227     0     0     0   242     0   227     0     0     0     0
CL    141     0     0     0     0     0     0     0     0     0     0     0
CO     27     0    25     0     0     0     0    40    15     0     0     0
CP      0     0     0     0     0   150    26     5   178     0     0     0
CR    614   655   357   532   459  1011  2057   361  1322   495  1086     0
CS    110   150     0    50   200   180   160    60   320   390   130     0
FD    248   203    95   115   101   384   128   154   202     0   389    53
FH      0     0     0     0     0    14     0     0     0     0     0     0
HI      0     0     0     0     0    67     0     0     0     0    67     0
HO      0     0     0     0     0     0     0     0     0  1300  1066   791
LI    147     0   218     0     0   440   158   128     0     0     0     0
MD     14    58     1   139     0    60     0   350    61   181     0     0
MG    450   450   450   800     0   900   450   580   475   475     0     0
MI     67    48    90   228    26   167    88    18    14   281    25    80
MZ      0     0    49    11     0     0     0     0     0    30    15     0
PH     54    18   157     0    54    66    67   149     0    88    38     0
TR      0     0     0    95   200   275     0     0     0     0     0     0
UT    178   218   199   159   100    74    98   145   105    87    96     0
XI      0     0     0   399     0     0   405     0     0     0     0   399
XS   2935  3418  3883  2583  4199  6321  3388  3115  2999  6056  3001  2777
ZC*   309     0    35     0   786     0     0     0   394     0     0   210

EXP  2798  2276  2102  2825  1487  4396  3532  2557  3017  3581  3288  1039
INC  2935  3418  3883  2983  4199  6321  3793  3115  2999  6056  3001  3177
NET   137  1143  1782   158  2712  1925   261   558   -17  2475  -286  2138

TOTAL EXPENSES        32896
TOTAL INCOME          45882
NET                   12985


                      THESE ARE YOUR ACCOUNTS

          AUTO       AU   BUSINESS  BU   CHILDCARE CC   CARINS    CI
          CLOTHING   CL   CONTRIB   CO   COMPUTER  CP   CREDCARD  CR
          CASH       CS   FOOD      FD   FHS       FH   HEALTHIN  HI
          HOMEIMP    HO   LIFEINS   LI   MEDICAL   MD   MORTGAGE  MG
          MISC       MI   MAGAZINE  MZ   PHONE     PH   TRAVEL    TR
          UTILITIES  UT   INTEREST  XI   SALARY    XS   MEMOACT   ZC

---------------------------------------------------------------------------
```

Coco-Accountant II

☞ Look At These Features ☜

- Handles all financial transactions
- Quick data entry
- List and total entries by month
- List and total entries by account
- List and total entries by payee/source
- Offsets income and expenditures
- Year-to-date summary by account
- Printed spreadsheet
- Flags deductible expenses
- Flags payments subject to sales tax
- Computes the sales tax paid
- User-defined accounts
- Sorts entries by date
- Store data on tape or disk

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```
11E9 0F    6F      00211        CLR    $6F     Device #0 (screen)
11EB AD    9F A002 00212        JSR    [$A002] Print character
11EF 35    96      00213        PULS   D,X,PC  Restore and return
11F1 A6    80      00214 PRINTM LDA    ,X+     Get a byte of message
11F3 27    F1      00215        BEQ    RETURN  All done if a zero
11F5 8D    F0      00216        BSR    VIDEO   Otherwise print it
11F7 20    F8      00217        BRA    PRINTM  Loop back for more
11F9 8E    1440    00218 INPUT  LDX    #INKEY  Start of inkey buffer
11FC 8D    42      00219 IN1    BSR    GETKEY  Get a key
11FE 81    0D      00220        CMPA   #$0D    Enter key?
1200 26    04      00221        BNE    IN2     Skip ahead if not
1202 6F    84      00222        CLR    ,X      Put 0 at end of data
1204 20    E1      00223        BRA    VIDEO   Print CR and return
1206 81    08      00224 IN2    CMPA   #$8     Backspace?
1208 26    0B      00225        BNE    IN3     Skip ahead if not
120A 8C    1440    00226        CMPX   #INKEY  Anything to backspace over?
120D 27    ED      00227        BEQ    IN1     Ignore it if not
120F 6F    82      00228        CLR    ,-X     Erase char from buffer
1211 8D    D4      00229        BSR    VIDEO   Erase it from screen
1213 20    E7      00230        BRA    IN1     Branch back for more
1215 81    20      00231 IN3    CMPA   #$20    Non-alphanumeric?
1217 25    E3      00232        BLO    IN1     Ignore it if so
1219 8C    144F    00233        CMPX   #INKEY+$0F Is buffer full?
121C 27    DE      00234        BEQ    IN1     Ignore it if so
121E A7    80      00235        STA    ,X+     Put char in buffer
1220 8D    C5      00236        BSR    VIDEO   Print it on screen
1222 20    D8      00237        BRA    IN1     Branch back for more
1224 BD    11F1    00238 YESNO  JSR    PRINTM  Print prompt
1227 8D    17      00239 YN1    BSR    GETKEY  Get key
1229 81    4E      00240        CMPA   #$4E    Is it "N"?
122B 26    08      00241        BNE    YN2     Skip ahead if not
122D 8E    1438    00242        LDX    #NO     "No"
1230 8D    BF      00243        BSR    PRINTM  Print the message
1232 8A    FF      00244        ORA    #$FF    Reset equal flag
1234 39            00245        RTS            Return
1235 81    59      00246 YN2    CMPA   #$59    Is it "Y"?
1237 26    EE      00247        BNE    YN1     Branch back if not
1239 8E    1433    00248        LDX    #YES    "Yes"
123C 8D    B3      00249        BSR    PRINTM  Print the message
123E 4F            00250        CLRA           Set equal flag
123F 39            00251        RTS            Return
1240 34    14      00252 GETKEY PSHS   B,X     Save B and X
1242 A6    9F 0088 00253 KEY1   LDA    [$88]   Get cursor character
1246 8B    10      00254        ADDA   #$10    Blink it
1248 8A    8F      00255        ORA    #$8F    Make it graphic
124A A7    9F 0088 00256        STA    [$88]   Print new cursor
124E 8E    0080    00257        LDX    #$80    Loop counter
1251 30    1F      00258 KEY2   LEAX   -1,X    Decrement counter
1253 27    ED      00259        BEQ    KEY1    Blink cursor if time
1255 AD    9F A000 00260        JSR    [$A000] Scan keyboard
1259 4D            00261        TSTA           Was key pressed?
125A 27    F5      00262        BEQ    KEY2    Branch back if not
125C 8E    13BB    00263        LDX    #BREAK  "<BREAK>"
125F 81    03      00264        CMPA   #$3     Was it Break key?
1261 1027  FF3A    00265        LBEQ   FINISH  Break out if so
1265 C6    60      00266        LDB    #$60    Blank character
1267 E7    9F 0088 00267        STB    [$88]   Erase cursor
126B 35    94      00268        PULS   X,B,PC  Restore and return
                   00269 *Routine below calls on a routine in the
                   00270 *Disk ROM. It accounts for the differences
                   00271 *between Disk Extended Color Basic 1.0 and 1.1
126D 34    02      00272 USEROM PSHS   A       Save A
126F B6    C005    00273        LDA    $C005   Check which version ROM
1272 84    01      00274        ANDA   #$1     Zero=1.0  One=1.1
1274 48            00275        LSLA           Zero=1.0  Two=1.1
1275 33    C6      00276        LEAU   A,U     Increment U if ROM 1.1
1277 35    02      00277        PULS   A       Restore A
1279 6E    D4      00278        JMP    [,U]    Use ROM routine
127B       C8A4    00279 DFNAME FDB    $C8A4   1.0 Process filename
127D       C952    00280        FDB    $C952   1.1 Process filename
127F       C468    00281 DOPEN  FDB    $C468   1.0 Open disk file
1281       C48D    00282        FDB    $C48D   1.1 Open disk file
1283       CA3B    00283 DCLOSE FDB    $CA3B   1.0 Close disk file
1285       CAE9    00284        FDB    $CAE9   1.1 Close disk file
                   00285 *Tape file types
1287       12FC    00286 TTYPES FDB    TYPE1   Basic program
1289       130C    00287        FDB    TYPE2   Data file
128B       1318    00288        FDB    TYPE3   M.L. program
128D       1328    00289        FDB    TYPE4   Non standard
                   00290 *
                   00291 *
                   00292 *Messages and prompts
                   00293 *
                   00294 *
128F       20      00295 TITLE  FCC    " TAPE TO DISK FILE TRANSFER"
12AA       0D      00296        FCB    $0D
12AB       20      00297        FCC    " ==========================="
12C6       0D0D    00298        FDB    $0D0D
12C8       52      00299        FCC    "READY TAPE & HIT ENTER? "
12E0       00      00300        FCB    $0
12E1       54      00301 TNAME  FCC    "THE FILE IS NAMED "
12F3       00      00302        FCB    $0
12F4       0D      00303 TTYPE  FCB    $0D
12F5       49      00304        FCC    "IT IS "
12FB       00      00305        FCB    $0
12FC       41      00306 TYPE1  FCC    "A BASIC PROGRAM"
130B       00      00307        FCB    $0
130C       41      00308 TYPE2  FCC    "A DATA FILE"
1317       00      00309        FCB    $0
1318       41      00310 TYPE3  FCC    "AN M.L. PROGRAM"
1327       00      00311        FCB    $0
1328       49      00312 TYPE4  FCC    "IN NON STANDARD FORM"
133C       00      00313        FCB    $0
133D       0D      00314 XFERIT FCB    $0D
133E       54      00315        FCC    "TRANSFER THIS FILE? "
1352       00      00316        FCB    $0
1353       54      00317 LDCOMP FCC    "THE LOAD IS COMPLETE"
1367       00      00318        FCB    $0
1368       0D      00319 DNAME  FCB    $0D
1369       44      00320        FCC    "DISK FILENAME? "
1378       00      00321        FCB    $0
1379       0D      00322 ALDONE FCB    $0D
137A       54      00323        FCC    "THE FILE TRANSFER IS COMPLETE"
1397       0D00    00324        FDB    $0D00
1399       0D      00325 CANCEL FCB    $0D
139A       54      00326        FCC    "THE PROCEDURE HAS BEEN CANCELLED"
13BA       00      00327        FCB    $0
13BB       3C      00328 BREAK  FCC    "<BREAK>"
13C2       0D00    00329        FDB    $0D00
13C4       53      00330 AGAIN  FCC    "START PROGRAM ANEW? "
13D8       00      00331        FCB    $0
13D9       13E8    00332 ERRS   FDB    E1
13DB       38      00333        FCB    $38
13DC       13F8    00334        FDB    E2
13DE       3C      00335        FCB    $3C
13DF       1410    00336        FDB    E3
13E1       3E      00337        FCB    $3E
13E2       141D    00338        FDB    E4
13E4       FF      00339        FCB    $FF
13E5       1429    00340        FDB    E5
13E7       00      00341        FCB    $00
13E8       44      00342 E1     FCC    "DISK SPACE FULL"
13F7       00      00343        FCB    $0
13F8       44      00344 E2     FCC    "DISK IS WRITE PROTECTED"
140F       00      00345        FCB    $0
1410       42      00346 E3     FCC    "BAD FILENAME"
141C       00      00347        FCB    $0
141D       42      00348 E4     FCC    "BUFFER FULL"
1428       00      00349        FCB    $0
1429       49      00350 E5     FCC    "I/O ERROR"
1432       00      00351        FCB    $0
1433       59      00352 YES    FCC    "YES"
1436       0D00    00353        FDB    $0D00
1438       4E      00354 NO     FCC    "NO"
           4F
143A       0D00    00355        FDB    $0D00
                   00356 *
                   00357 *
                   00358 *Variables and pointers
                   00359 *
                   00360 *
143C       0000    00361 TOPMEM FDB    $0      End of system's memory
143E       0000    00362 EOF    FDB    $0      End of tape file
1440               00363 INKEY  RMB    $10     Space for input buffer
1450               00364 HEADER RMB    $10     Space for tape file header
1460               00365 BUFFER *All of the rest is for the BUFFER
           1000    00366        END    START   Execution begins at START
00000 TOTAL ERRORS
```

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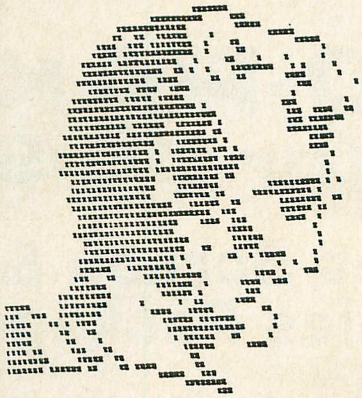

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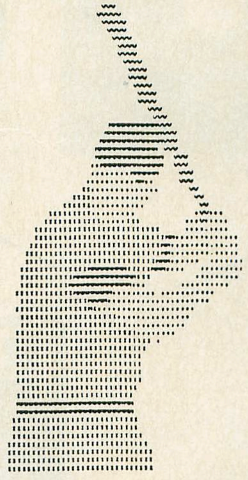

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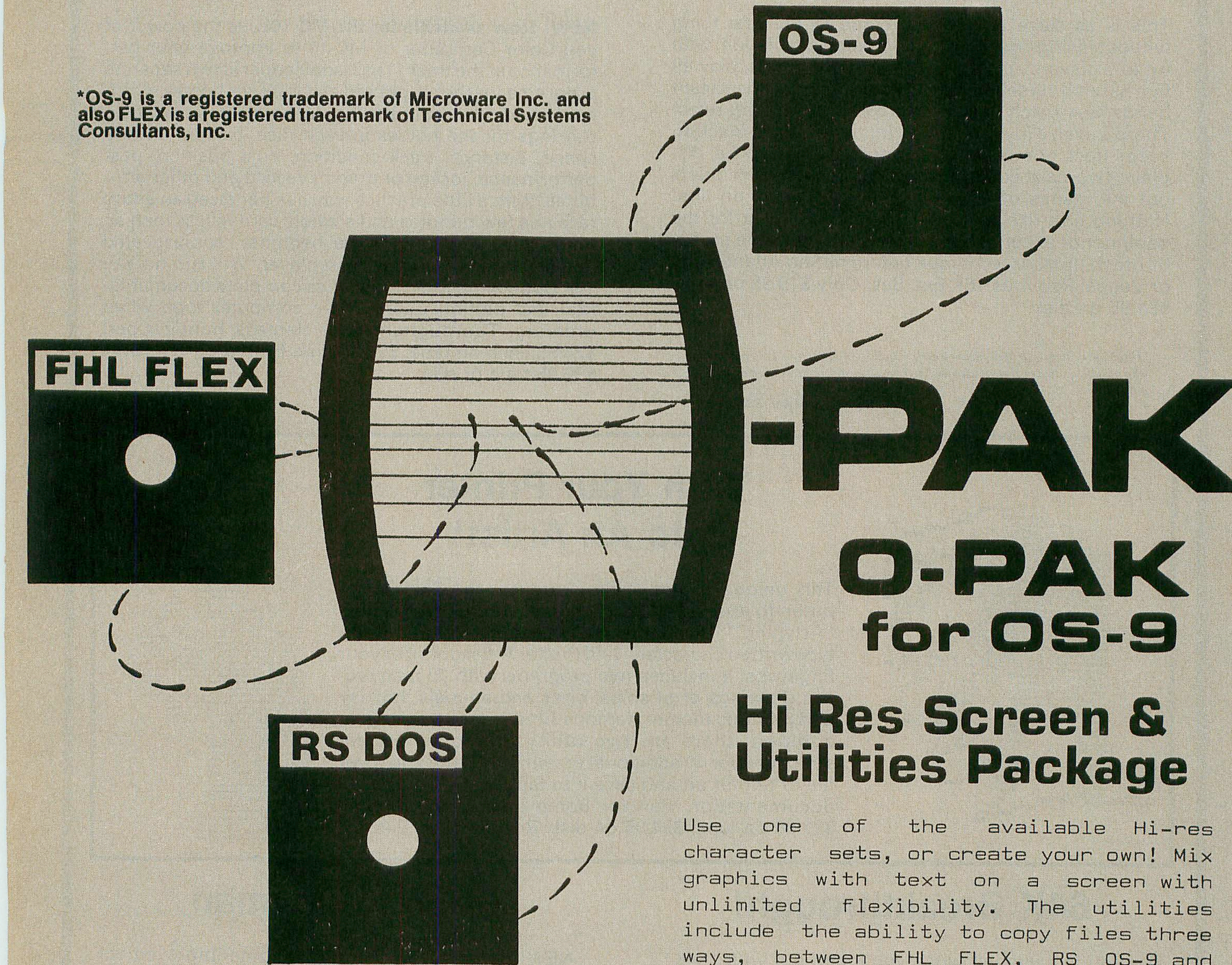

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Getting Started With Machine Language

By Dan Downard
***Rainbow* Technical Editor**

How many of you have noticed the assembly listings in *the Rainbow* and just gone to another article, since "I'm not interested in that anyway," or "I don't know how to input that program into my CoCo." If you answered yes to the "not interested" comment, go to the next article. If you want to input one of these listings, read on and we guarantee you will be an expert in one quick lesson. In this article, we will give you a machine language program, show you three different ways to input it into the CoCo, and how to save it on tape for future use.

For this exercise you will need an understanding of hexadecimal numbers, a CoCo with at least 16K of memory (Non-Extended is fine) and a monitor such as *C-Bug, HUMBUG* or *ZBUG*. As you probably know, *ZBUG* is the Radio Shack monitor for all of the examples. Other monitors will work fine, but we have to start somewhere.

The Program "LF"

Listing 1 is a short machine language program that should be of interest to all of you using non-Radio Shack printers. It adds a line of feed after carriage return for those printers that require line feeds to be added by the computer. Don't give up if you have a Radio Shack printer. The program will still work, but you will notice double spacing. After all, our interest here is in just getting the program to run.

Notice Listing 1 is divided into eight different columns of information. For this discussion, a column may be more than one digit long. For example, the fourth column is the line number as we are accustomed to seeing in BASIC programs. This particular program starts with Line 00100 or 100. We will refer to the line number several times, so be sure you can identify it.

Remember, in BASIC, how a *REM* or ['] command was ignored by the actual program, but inserted in programs for reference. The equivalent instruction in the assembly listing is [*]. When a [*] is encountered in a program, all of the line that follows can be considered a remark and inputting is optional. That means, in Listing 1, Lines 100 through 150 are for reference only and just explain what the program is all about.

What is all the rest of that garbage? Well, to jump ahead a little bit, all of the information to the right side of the line number, including the line number itself, is what we call the assembly text file. All of the information to the left of the line number is the actual machine language program in hexadecimal form. Depending on which method we use to input our program we will use part of this information to perform the chore.

Method #1—Using and Assembler

An assembler is a program that converts mnemonic instructions into actual machine code. We do not have to understand how the actual program works to use the assembler. Again, just picture the assembler as a language like BASIC. If we input a program and save it, all we have to do to run it again is type *CLOADM* and *EXEC.*

Back to Listing 1. Columns 4 thru 7 contain all of the information necessary to input a machine language program using an assembler. A short explanation of each column of text is in order. Let's use Line 190 as an example:

Column 4-00190 — The line number
Column 5-START — Symbol
Column 6-LDX — Command (or Mnemonic)
Column 7-1+HOOK — Operand

Column 8 is not used in this particular program, but is an optional comment field. Again, inputting any comments can be left up to the user. In the actual operation of *EDTASM+*, these columns are called fields and seperated by inputting a right arrow.

The first thing we must do is plug in our *EDTASM+* cartridge. Be sure the CoCo is turned off. After seeing the

(Dan Downard is an electrical engineer and has been involved in electronics for 24 years through ham radio (K4KWT). His interest in computers began about five years ago and he has built several 68XX systems.)

logo and the [*] prompt we are ready to go. Type [I] and then hit the [ENTER] key and 00100 should appear. This gives you auto line numbering starting at 100, incrementing each line number by 10. Sounds good already, doesn't it? Using [RA] for the right-arrow key and [E] for enter we would use the following keystrokes to input the program:

```
00100 *LF-RAINBOW JAN 1984[E]
........
00160 HOOK[RA]EQU[RA]$0167[E]
00170 PRTOUT[RA]EQU[RA]$A2BF[E]
00180 [RA]ORG[RA]$3F00[E]
00190 START[RA]LDX[RA]1+HOOK[E]
00200 [RA]STX[RA]1+OUT2,PCR[E]
........
00360 [RA]END[RA]START[E]
00370 [BREAK]
```

A few comments are in order. First, auto line numbering does not have to be used. If a listing is not in a logical sequence, just hit [BREAK] and [I] and the next line number. Second, always make sure your text is in the proper field (column). Some fields will be empty, but don't worry about it.

When all of the text is entered prepare your tape recorder and type A LF[ENTER]. This will "assemble" your text file into a machine language program and store it on cassette. If it is a long program it is usually a good idea to save the text file for future reference using the "W" command.

Turn off the computer, remove the *EDTASM+* cartridge, turn it back on and type *CLOADM*"LF" and *EXEC*. You're in business. Any printer output will now contain line feeds.

Method #2—Using a Monitor

If you don't want to type in the assembly text, there's an easier way. Just input the machine language program directly into memory with a monitor such as *ZBUG*. In Listing 1, the first three columns are the actual machine language program in hexadecimal form.

The first column is the address. The next two columns are the hex numbers that you will put at each respective address. The reason that two columns are displayed is that the second column always contains the op-code, or operational code, recognized as an instruction by the microprocessor. This op-code corresponds to the mnemonic instruction we referred to earlier in the assembly text file.

Let's input our program using *ZBUG*. First, we turn on the computer after the *EDTASM+* cartridge has been inserted. Type Z and *ENTER* and you see a different prompt, a [#]. *ZBUG* is now waiting for your command. Since we wish to input hexadecimal bytes we type [B] [ENTER] to enter the Byte Mode. From this point, the only problem is knowing where to start.

If you examine Listing 1, you will notice that the first line that has anything in Column 2 is Line 190. Aha! This must be the start of the program at address $3F00. Very good. Just as a side remark, the data to the left of the line numbers in Lines 160 and 170 are just constants for program definition. Always start when you see data in the second column.

Notice that immediately following the address, I put an FF in the second column. This can be any value and is generated by *ZBUG*. It is the present value of data at that address before you change it.

Using [DA] for down arrow (enter data and advance address in *ZBUG*) and [E] for [ENTER], a session with *ZBUG* would go like this.

First, you see the [#] prompt already on the screen. So, type 3F00 and a [/] slash mark. On hitting the slash mark, the value of the existing byte will appear and a flashing cursor will appear several spaces to the right. Okay?

Now, type BE and hit the down arrow. You will observe that the next address will be displayed, as well as its value. So, to continue, you enter the next hexadecimal byte, namely 01 and press the down arrow. If you accidentally hit [ENTER], simply pressing the slash mark will return you to the same address. If you enter an incorrect value, you can step back to a previous address by hitting the up-arrow key.

```
#3F00/ FF BE[DA]
#3F01 FF 01[DA]
#3F02 FF 68[DA]
#3F03 FF AF[DA]
#3F04 FF 8D[DA]
#3F05 FF 00[DA]
#3F06 FF 21[DA]
#3F07 FF 86[DA]
........
#3F27 FF 7E[DA]
#3F28 FF 82[DA]
#3F29 FF 73[DA]
#3F2A FF [E]
```

After you have input the program type 3F00/ and keep hitting the [DA] key. You will see the program you have just input.

The only other problem we may encounter is the starting address of the program. The *EXEC* address of this particular program is $3F00, but that may not always be the case. Read the accompanying article or the comments in the given listing you want to assemble to find the proper starting address.

After the program is in memory and you are still in *ZBUG*, type P LF 3F00 3F29 3F00 to save the program to tape. From now on, a *CLOADM* and *EXEC* will execute the program from BASIC.

Method #3—BASIC

Listing 2 is a short BASIC program that will allow you to input a machine language program into memory. Type in and *RUN* this listing. After entering the starting address at the prompt, you enter the same data as in Method #2. Instead of the down-arrow key, hit [ENTER] indicated by [E], after every byte something like this:

```
STARTING ADDRESS? 3F00[E]
3F00? BE[E]
3F01? 01[E]
........
3F29? 73[E]
3F2A? [BREAK]
```

After the program is in memory, you can save it by *CSAVEM*"LF",&H3F00,&H3F29,&H3F00. Be careful, as there is no way of checking for mistakes other than taking your time.

This method requires Extended BASIC, but no Monitor or Assembler. It is crude, but it works and can be used if you are desperate.

Summary

I hope you will try the different methods described and pick one that you are comfortable using; that's the real secret of success anyway. The next time one of your friends asks where you got that fantastic graphics program you can say, "I put it in myself from *the Rainbow!*"

Editor's Note: For another look at getting started in machine language, refer to this month's "Assembly Corner" by Dennis Lewandowski.

Listing 1:

```
                    00100 *LF-RAINBOW JAN 1984
                    00110 *REV 0-DAN DOWNARD
                    00120 *THIS PROGRAM WILL ADD
                    00130 *A LINE FEED EACH TIME
                    00140 *A CARRIAGE RETURN IS
                    00150 *OUTPUT TO THE PRINTER
          0167      00160 HOOK    EQU    $0167
          A2BF      00170 PRTOUT  EQU    $A2BF
3F00                00180         ORG    $3F00
3F00 BE   0168      00190 START   LDX    1+HOOK
3F03 AF   8D 0021   00200         STX    1+OUT2,PCR
3F07 86   7E        00210         LDA    #$7E
3F09 B7   0167      00220         STA    HOOK
3F0C 30   8D 0004   00230         LEAX   OUT,PCR
3F10 BF   0168      00240         STX    1+HOOK
3F13 39             00250         RTS
3F14 34   05        00260 OUT     PSHS   B,CC
3F16 D6   6F        00270         LDB    <$6F
3F18 C1   FE        00280         CMPB   #$FE
3F1A 26   09        00290         BNE    OUT1
3F1C 81   0D        00300         CMPA   #$0D
3F1E 26   05        00310         BNE    OUT1
3F20 BD   A2BF      00320         JSR    PRTOUT
3F23 86   0A        00330         LDA    #$0A
3F25 35   05        00340 OUT1    PULS   B,CC
3F27 7E   8273      00350 OUT2    JMP    $8273
          3F00      00360         END    START
00000 TOTAL ERRORS

HOOK    0167
OUT     3F14
OUT1    3F25
OUT2    3F27
PRTOUT  A2BF
START   3F00
```

Listing 2:

```
10 'ML-RAINBOW JAN 1984
20 'REV0  DAN DOWNARD
30 'THIS PROGRAM WILL ALLOW
40 'YOU TO INPUT MACHINE
50 'LANGUAGE PROGRAMS USING
60 'EXTENDED BASIC-HIT break
70 'WHEN YOU ARE FINISHED
80 INPUT"STARTING ADDRESS";S$
90 I=VAL("&H"+S$)
100 PRINTHEX$(I);:INPUT B$
110 POKEI,VAL("&H"+B$)
120 I=I+1:GOTO100
```

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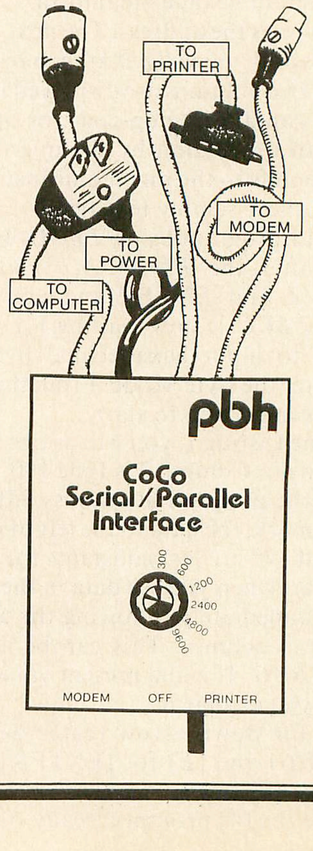

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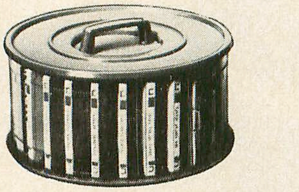

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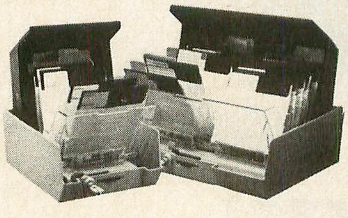

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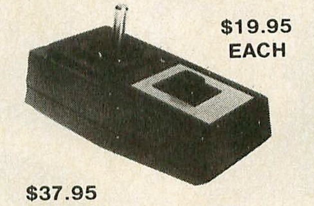

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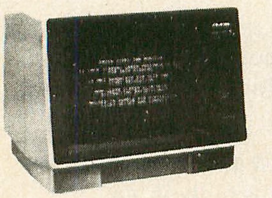

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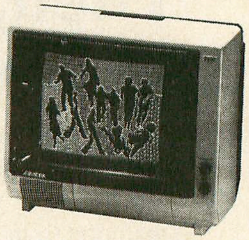

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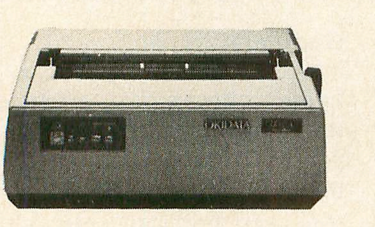

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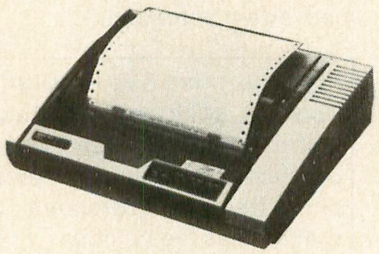

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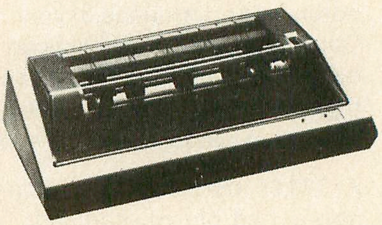

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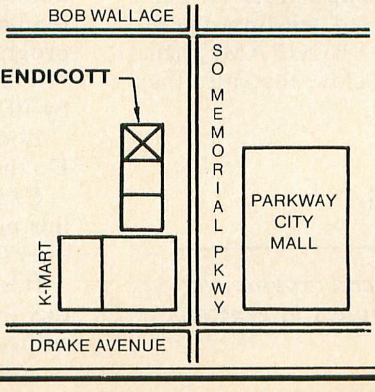

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For That Added Touch You Need *Append*

By Joseph Kolar
Rainbow Contributing Editor

How many times have you wanted to add a nifty routine or an entire program to one that you have just created? How you wished you wouldn't have to go through the drudgery of keying it into your program!

There is a technique that can make your wish come true. It is called *Append.* For our purposes, it means, "to add one program to another and by linking them together, to create an improved, expanded and enhanced program."

It is not necessary to append an entire program. Selected routines may be extracted, renumbered and appended.

Imagine that you created *KOLARDES,* (see Listing 1), a graphic program. You decide to dress it up by adding a nice title card. You have this program, *+TITLE,* (see Listing 2), that you would like to tack onto the front of your program.

+TITLE can be used over and over again. You will want to change lines 10060 and 10070 and put in your name and address. All that is needed is a neat name for your program.

+TITLE was made to give you practice following instructions. No doubt, you can make better title cards. You would be advised to make a copy of *+TITLE* after you are finished keying it in. Make sure you do this before following instructions in line 10300. This program sort of self-destructs and what you have when you finish is not what you started out with.

KOLARDES uses sound to enhance the random designs and to act as a counter. If the sounds bug you, feel free to change them. If they still bug you, turn the sound down. I think you will find the ever-changing designs amusing.

Before we begin, get a piece of 3 x 5 paper from the pad you keep on top of the monitor. With a red, felt-tipped pen, on top of the long side, print APPEND PROGRAM. Then with a black, felt-tipped pen, print below the title, the following:

1. *CLOAD* low numbered lines
2. *POKE* 25,*PEEK*(27) [ENTER]
3. *POKE* 26,*PEEK*(28)-2 [ENTER]
4. *CLOAD* high numbered lines
5. (If you have Color BASIC,) *POKE*25,6[ENTER]
6. (If you have Extended BASIC,) *POKE*25,30 [ENTER]
7. *POKE* 26,1 [ENTER]

Consider this card a training aid and keep it in a handy location. Store it on top of the TV set next to the dispenser mentioned in the first article (December 1982). When appending a program, place the card on top of the computer, between the air vents for easy reference.

Note: If you have ECB and start up the computer, it will automatically PCLEAR4. If you are using a PCLEAR other than PCLEAR4, to find the correct number for line 5, (above), PRINT PEEK(25), before you CLOAD in the second program.

As usual, there is more than one way to do anything. You could *CLOAD* "+TITLE" and *RUN* and, following the instructions in +TITLE, complete the title card; *CSAVE* it; *NEW CLOAD*"KOLARDES," follow the instructions on your reference card; *CLOAD*"+TITLE" (which you finalized) and then finish appending. But, for the purpose of the demonstration, *do not* use the perfectly acceptable procedure above.

First, *CLOAD*"KOLARDES" per instructions from your handy reference card. Make sure it works properly. Make a note of the last line number in the listing. If you make a long spread-out, numbered listing, you may want to make it more compact by renumbering it. *RENUM* 10,10,10. The first "10" means that you want the new listing to start with Line number 10. The second "10" means that you want the renumbering operation to start with Line 10 of the original program. (This number could be any number.) The third "10" signifies that you want to increment each line number by 10. (10;20;30; etc.)

Look at Line 2 of the reference card. Carefully key it in. Do the same at Line 3.

CLOAD"+TITLE" and *RUN. LIST* to find the lowest line number in the program. This number must be greater than the last number of the first program.

It is good practice to renumber the appended program at this time. *RENUM* 10000,10,10 and [ENTER] usually is sufficient unless the highest number in the first program is

---

(Joseph Kolar is a free-lance writer and programmer dedicated to proselytizing for computers in general, and the CoCo specifically.)

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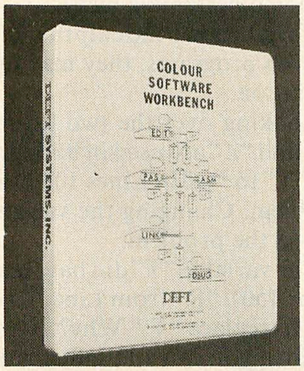
Part ONE of the CSW User's Guide tells you how to use all of the programs in the Workbench. This first part contains one section for each program.



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- Explanation of Source Listing Format

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Part TWO of the CSW User's Guide provides you with the background information needed to write programs using the Colour Software Workbench.

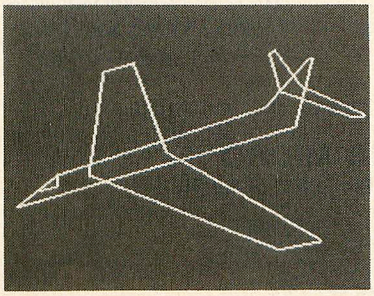
LEARNING EXERCISE
- Complete Pascal and Assembler Language Source
- Uses All Parts Of the Workbench
- Resulting Program is a Text Processor

PASCAL
- Describes Standard Language Elements Supported
- Constants Include Decimal and Hexadecimal Integers, ASCII characters and strings
- Types Include:
  - ○ Integer, Char, Boolean, Enumerated, Subrange
  - ○ Multi-Dimensioned Arrays
  - ○ Records and Variant Records
  - ○ Sets of Up to 256 Elements
  - ○ Files
- PROCEDUREs and FUNCTIONs with FORWARD
- Variables and LABELs
- Arithmetic, Boolean, and Set Expressions
- Statements: IF, WHILE, REPEAT, CASE, GOTO, EXIT, FOR, BEGIN, assignment (:=)
- Input/Output: RESET, REWRITE, READLN, EOF, WRITE, WRITELN, CLOSE, PAGE
- Built-in Functions and Procedures: ABS, CHR, CURSOR, ODD, ORD, PRED, SUCC

ADVANCED PASCAL
- Strings Support: Assignment, Comparing, Concatenation
- String Procedures and Functions: STRINGCOPY, STRINGDELETE, STRINGINSERT, STRINGPOS, HEX, ENCODE, DECODE
- Type Extensions for Structured Type Breaking
- Absolute Memory Access via Built-in WORD and BYTE Arrays
- ROM Routine Access via CALL Built-in Function
- Static and Public Variable Allocation
- Separate Compilation and Assembler Interface via INTERFACE, EXTERNAL, and PUBLIC
- Listing and Multiple Source File Directives
- Explanation of Error Messages

6809 MACRO ASSEMBLER
- Motorola Compatible Source Conventions
- Macro Facility With up to 9 Macro Parameters
- Separate Compilation and Pascal Interface via PUBLIC and EXT Directives
- Listing Control Directives
- Explanation of Error Messages

TECHNICAL NOTES
- CoCo ROM Compatibility
- Pascal Runtime Library Assembler Interface
- CSW Object File Format



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greater than 10000.

It is also good practice to keep all your appending programs on one cassette tape; to put a "+" in front of the program name; and to renumber all append programs so their starting Line number is 10000. You will know that any program with "+" in front of the title will begin with Line number 10000 and is for appending purposes.

Did you remember to change Lines 10060 and 10070?

When the *+TITLE* program is renumbered, *RUN* and follow the screen commands. Pick out a nice title for your main program. Note: You can copy the three inputs down, but once you get the hang of it, you should have no trouble keeping it in your head. After the "red title" appears, note the centering. If it looks right, [ENTER] and follow instructions. If you made a boo-boo [BREAK], and do it over.

Carefully retype Lines 10000—10020, making sure you put double quotation marks (") around the name of the title. Then *DEL*10300- and *RUN*. Your second program is now completed. Note: Even though *KOLARDES* is in memory, it is not disturbed when you *RUN, LIST, RENUM* the *+TITLE* program.

Now key in the appropriate Line 5 from your reference card. [ENTER]. Key in Line 6. [ENTER] and *LIST*. As the listing fast scrolls up you should be able to spot line numbers from both the main and the appended program and end with Line 10080.

Both programs are now combined, but not quite integrated to work as one unit.

The title of this program should appear first. Both programs have to be linked together. In this case, key in:

10 GOTO 10000
10100 GOTO 100

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You can see that we send the program to the title and after the title is created and displayed, we return to *CLS* and begin the main program.

RUN. It will work, but not as before! Can you figure out what is different?

When you ran *KOLARDES* by itself, after about 20 beeps Line 150 recycled to a random color. After appending the *+TITLE* program and linking them both together, Line 150 became inoperative and did not recycle after 20 beeps. Can you determine why?

Variables are the culprits. When the same variable is used in both programs, they may often be responsible for faulty operation.

Looking over the two listings, we see that the variables "T" and "Z" are used in both programs. Changing the variable "T" to "G" in Lines 10020 and 10050 did not correct the problem. Changing the variable "Z" to "H" in Line 10080 solved the problem.

The variable "T" did have a minor but unimportant effect. (Line 150). "R" from Line 145 could have been used in Line 150 to replace "T." Why?

Now, you can add informational or instructional lines to the title; hold it with *INPUT*"Press [ENTER]";01 or send it to Line 100 after a few seconds with Line 10080.

Your program should be complete and work fine. You can use *+TITLE* with any program to add a title.

Be careful not to have the same line number in both programs. For instance, you can't have two Line 100s or you will drive the computer nuts.

Let's say for argument's sake that when you appended *+TITLE* that you inadvertently had Line numbers 100; 110 and 120 at the beginning of *+TITLE*. You did not notice this until you completed the appending procedure and listed it.

To get rid of the three unwanted lines that lie in the sequence:

200 NEXT K,J,: FOR P=1 TO 1000:NEXT: GOTO 120
100 'LEFT IN BY MISTAKE
110 'Print
120 'Print
10000 PRINT:PRINT:PRINT:INPUT "YOUR TITLE"; A1$

1. Copy down the last line of the first program. (Line 210)
2. Copy down the first line of the second program which you want to keep. (Line 10000)
3. <DEL210-10000>
4. Retype Lines 210 and 10000

The unwanted lines have gone bye-bye!

You've covered a lot of ground and added a new tool to your repertoire. You should be proud because you came a long way.

10080...0123
END... 02C1

Listing 1

```
10000 PRINT:PRINT:PRINT:INPUT"
YOUR TITLE";A1$
10010 PRINT:INPUT"  COUNT ALL LE
TTERS AND SPACES  IN THE TITLE.
 (IF RESULT IS AN ODD NUMBER, AD
D +1.  DIVIDE THE RESULT BY 2.
```

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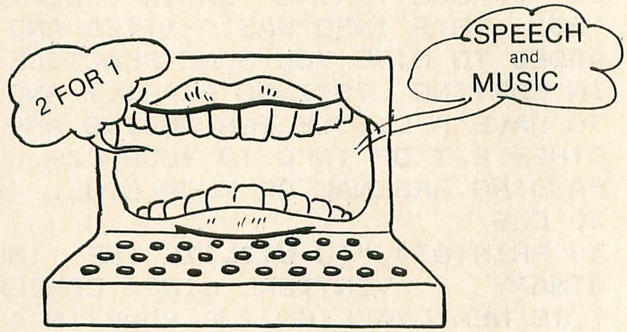

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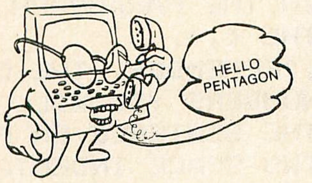

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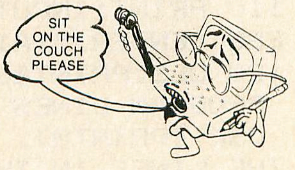
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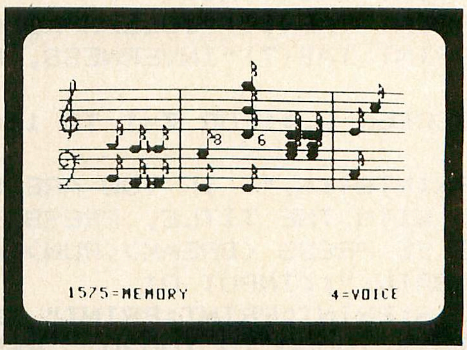

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```
L=";L
10020 PRINT:INPUT"  16-L=";T
10030 CLS
10040 FOR I= 1 TO 6:PRINT:NEXT
10050 PRINT TAB(T)A1$
10060 PRINT TAB(10)"JOSEPH KOLAR
10070 PRINT TAB(7)"INVERNESS, FL
ORIDA
10080 SCREEN 0,1:FOR Z=1 TO 1500
:NEXT
10300 PRINT@416,"  IF YOU ARE SA
TISFIED WITH THE TITLE, PRESS <E
NTER> ELSE PRESS <BREAK><RUN> AN
D TRY AGAIN.";:INPUT O1
10310 CLS:PRINT:PRINT:PRINT"  RE
TYPE LINES 10000 TO 10020.  REME
MBER TO PLACE QUOTE MARKS   AROU
ND YOUR TITLE IN LINE 10000.
10320 PRINT:PRINT" 10000 A1$=(YO
UR TITLE)             10010 L=(LENG
TH/2)                 10020 T=16-L.
10330 PRINT:PRINT"  DELETE LINES
 10300-10330 AND  APPEND THIS TO
 YOUR MAIN PRO-   GRAM.  DON'T F
ORGET TO LINK IT  UP!
```

Listing 2

162.....0123
END... 022B

```
100 CLS
110 J=0:K=0:ZZ=0
120 A=RND(63)-1:AA=RND(15)+1
130 B=RND(31)-1:BB=RND(31)
140 X=RND(8):  Y=RND(4)
145 R=RND(8)
146 M=R+4
150 Z = Z+1 :IF Z = 20 THEN Z=0:
CLS(T): GOTO 120
155 T=RND(8)
156 IF T=8 THEN SOUND 89,M
157 IF T=7 THEN SOUND 108,M
158 IF T=6 THEN SOUND 125,M
159 IF T=5 THEN SOUND 133,M
160 ZZ=Z-INT(Z/2)*2
162 IF T=3 THEN SOUND 147,M
163 IF T=2 THEN SOUND 159,M
164 IF T=1 THEN SOUND 170,M
166 IF T =4 THEN PRINT @ 8," KOL
AR'S DESIGNS ";:SOUND 176,M
167 FOR S = 1 TO 400: NEXT S
170 FOR J = A TO B STEP((A>B)*2+
1)*X
180 FOR K=AA TO BB STEP ((AA>BB)
*2+1)*Y
190 ON ZZ GOTO 200: RESET(J,K):G
OTO 210
200 RESET(J,K)
205 SET(J,K,Y)
210 NEXT K,J: FOR P=1 TO 1000:NE
XT:GOTO 120
```

Listing 3

40..... 024A
90.....03CD
END... 05FC

```
10 '***SEE TAKING 'BASIC', SEPT.
'83.  THIS INFO WAS OMITTED AND
ADDED TO GIVE YOU SOME PRACTICE
IN COPYING LISTINGS EXACTLY AND
TO HAVE A LITTLE FUN ADDING AN-
OTHER BIT OF INFO TO YOUR EX-
PANDING ARSENAL OF KNOWLEDGE.
20 CLS
30 PRINT@34,"TO UTILIZE THE 'IMA
GINARY      VERTICAL LINE' CONCEP
T TO NEATLYALLIGN THE ROWS IN A
PARAGRAPH, WHEN USING <PRINT@> S
TATEMENTS, DO THE FOLLOWING:"
40 PRINT@226,"IT IS ASSUMED YOU
WILL USE TWOSPACES TO INDENT THE
 FIRST WORD OF THE SENTENCE OR P
ARAGRAPH.  LINE LOCATION IS FOU
ND BY ADDING+2 TO THE FIRST PRIN
T@ SCREEN   ROW LOCATION. (2ND R
OW=32+2).
50 PRINT:INPUT" TO CONTINUE, PRE
SS <ENTER>";O1
60 CLS:PRINT@64+2,"YOU MAY USE <
PRINT@32+2,> OR   YOU MAY USE <P
RINT@34,>.
70 PRINT@162,"DO NOT INCLUDE ANY
 SPACES BE- TWEEN THE FIRST QUOT
E MARK AND  THE FIRST LETTER OF
THE SENTENCEOR PARAGRAPH."
80 PRINT:PRINT:INPUT"  TO CONTIN
UE PRESS <ENTER<";O1
90 CLS:PRINT@34,"THE IMAGINARY L
INE WILL BE UN-DER THE <,>.  ALL
 FURTHER LINES IN THE PARAGRAPH
WILL FALL UNDERTHE <,>.
100 PRINT@192+2,"REMEMBER, THE O
NLY LOCATION   NUMBERS YOU WILL
USE TO FORMAT  THE SENTENCE OR P
ARAGRAPH WITH ATWO SPACE INDENTA
TION WILL BE:  2; 34; 66; 98; 13
0; 162; 194;   226; 258; 290; 32
2; 354; 386;   418; 450; 482;"
110 PRINT:INPUT"  TO CONTINUE PR
ESS <ENTER>";A1
120 CLS:PRINT@66,"NEARLY ALL THE
 PROGRAM LINES  IN THIS TUTORIAL
 USE <PRINT@>.  YOU MAY COMPARE
THE LINES IN THELISTING WITH THE
 DISPLAY.
130 PRINT@226,"I THINK THAT I SH
ALL NEVER SEEA POEM LOVELY AS A
TREE OR A    MAGAZINE AS GOOD AS
 'THE RAIN-  BOW' TO KEEP MY INT
EREST IN THE COLOR COMPUTER FROM
 FLAGGING!"
```

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FOR YOUR COLOR COMPUTER

EDUCATION OVERVIEW

Of What Value Are Traditional Skills In A Rapidly Changing Culture?

By Michael Plog, Ph.D.
Rainbow
Contributing Editor

The January issue! I know you will get this magazine before the end of December, so please let me take this opportunity to say Merry Christmas and Happy New Year. If you did not get something special for your Color Computer for Christmas, why not buy yourself a present? Now, let's get to a thought for this month's article.

Anytime a new technology is used in an educational setting, familiar arguments are pulled from ancient storage locations. When writing was first invented, many complained that it would ruin the memory of youth. With the advent of the typewriter, complaints about the loss of the art of penmanship were heard. Of course, the arguments were presented from the other side, also. What use is crowding the mind with all that information that can be written and reviewed anytime? What is the value of penmanship, especially if all that is needed is a signature at the bottom of a letter?

In modern times, the calculator has probably caused the greatest revival of this old argument, and the microcomputer will be next. One side will note the declining skills; the other side will ask the relevance of those skills.

This article is a response to a letter I received from Max James, whose questions are used throughout. I am indebted to Mr. James for causing me to think hard about topics that can frankly be uncomfortable.

(Michael Plog received his Ph.D. degree from the University of Illinois, the M.S. from Memphis State University, and the B.S. from the University of Tennessee. For his foreign/research language option required for the doctorate, he naturally selected computer language. Michael currently works for the Illinois State Board of Education as a research and evaluation specialist.)

Mr. James asked for my comments to a few questions: If pocket calculators can perform all arithmetical operations, why should students spend time learning arithmetical skills? If an inexpensive microcomputer can solve algebra problems, why learn paper and pencil algebraic procedures? Is there any justification for continuing to teach archaic subjects, such as Roman numerals; square and cube root extractions; slide rule procedures; use of logarithms for multiplying, dividing, raising to powers, etc.

Now do not misjudge Mr. James. Max is not a simple malcontent. The man majored in math, minored in education, obtained a M.A. degree, and made a living as an electronics engineer and computer expert. The questions are important, and will be addressed in and out of the educational community for months to come. Mr. James only got to these questions before others did.

I must admit that my major was not math; I know a little about the subject, but am far from an expert. I think, however, the basic questions can be asked for any field of study, not simply mathematics.

For some questions discussed here, there is no justification, but a possible explanation. Teachers tend to teach what they know, and further, teach it the way they were taught. This causes a certain amount of inertia in curriculum, I will say that it is to the credit of American public schools that this inertia is not greater than it is. Some subjects (penmanship being one example) gradually fall from use and gently disappear. My aunts write beautifully; they had to pass penmanship when they were in school. My handwriting (we do not even call it penmanship anymore) is horrible; I used a typewriter in high school.

I imagine that some subjects, such as the use of a slide rule and cube root extractions, will follow the same path as penmanship, and gradually disappear from schools, except for those classes in the theory and history of mathematics.

There is more to this debate and sincere questioning, however, than inertia. The definition of "education" is based on expectations of society. Our current society places no value on ability to form tools from pieces of flint. Yet, in Neanderthal society, and even before, a young person's education would be incomplete without this skill. I can imagine an old stone knapper saying to a young, clumsy pupil, "Well, it may be functional. You can cut with it, but your lines show a lack of grace!" Yes, the stone tools were artistic as well as useful. Sort of like a teacher today telling a student, "Your program will do the job, but it could be done with greater ease (and, yes, beauty) if you used a *FOR/NEXT* loop here."

We likewise have no need of recognizing poison plants, like some cultures today making a living by hunting and gathering. We simply have little need in our world of knowing such things.

But, knowledge of some information is expected, and considered necessary by the majority of members of our society, to operating within the cultural structure. For example, arithmetic skills fall in this category. In some societies, of course, addition (which is really nothing more than counting) is not important. Number systems go something like, "One, two, three, many." Another example of knowledge considered essential in our society is elementary facts about an internal combustion engine. Even people who never drive know that a car needs gas and oil, and cannot be driven on a flat tire.

Every society I know of includes history as one of the major things to know. A sense of belonging to some larger structure (country, philosophy) may not be restricted to the human species, but is certainly present in the entire range of social structures on the planet today.

There are other "expected" skills and knowledge that must be mastered before members of a culture are willing to admit the young to adult status. We will not discuss all of them here.

In the future, computer skills may be just as accepted and expected as math skills are now. At the moment, however, we are in transition. And societal transition takes a long time. The transition takes two forms. One group will speak of important things that are missing (but should not be) from schools. We are now seeing a wide range of people—not just computer nuts—discussing seriously the need for knowledge about computers for tomorrow's citizens. The second group of people are represented by the questions asked by Mr. James: Why are archaic topics so heavily present in schools?

Expectations of society is not totally the answer, but is the most powerful explanation I can offer. A person without the minimum elements of expected knowledge is hampered in almost all communication with other members of the culture. Naturally, in a pluralistic society such as ours, the expectations vary not only from one group to another, but among members of the same group. Schools have to fit the expectations of the major forces in the society, and please important minorities. At this particular time, the computer evangelist (I admit I fit this category) may be in a minority, but certainly growing in importance.

I may not have provided a justification for the questions asked by Mr. James. The explanation may be all there is; perhaps there is no reasonable justificaiton. As an educator, I accept certain principles as assumptions. In mathematics, there are several assumptions that cannot be proved, but have to be accepted in order for the entire field of study to work properly. Well, in a similar manner, I have certain assumptions about education.

An educated person is one who knows why things work. We (as a culture) need some people who know why arithmetic works, so the rest of us can use it. We need some people who know why computers work, so the rest of us can enjoy the use of our electronic tools. The more areas I know how things work, the less ignorant I am. It is the job of education (another assumption on my part) to reduce ignorance in as many areas as possible.

Mr. James, I hope this response at least partially addresses your questions. You have provided me with something to think about, and made me wonder and work a little. Thank you for helping my education.

On to another topic, we owe congratulations to William Gattis. He has recently been promoted to Vice President, Radio Shack Education Division. Mr. Gattis helped implement the Tandy Educational Grants program (which has awarded about $600,000 worth of products to non-profit institutions). He also designed and introduced the Tandy program offering BASIC and general introduction courses provided free to educators. Good job, Bill.

See you next month. Until then, keep on thinking about education.

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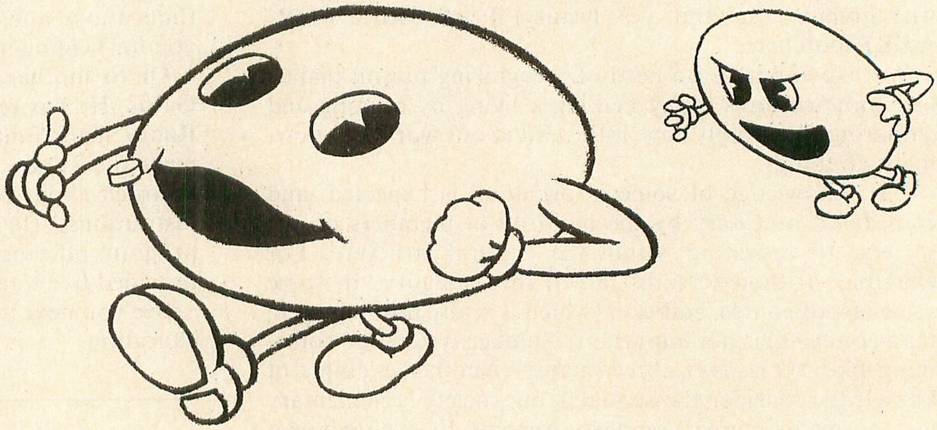
GAME

16K

Losing This Action 'Pac'ed' Game Is A Real 'Pill'

By Martin S. Montes



"Short and sweet" is the old adage describing quick action with good results. Such is the case with this pill-swallowing game called *Pac 'Em.* The program is short and the game play is oh so sweet.

When typed in the 80C and *RUN*, the game provides you with a delectable platter of fuel pills. You are the large empty circle on the screen and your adversary is the large solid dot on the screen. Your objective is to eat all the pills on the screen by moving yourself over them using the four direction arrows. Avoid your adversary though, his only intent is to swallow you whole and end the game.

If you maneuver carefully and swallow all your pills, you get a fresh but larger screen of pills. As you eat the pills your fuel increases. The solid pills contain extra fuel but be sure you get to them before your foe does to enjoy their full potential. Your fuel is gauged by the solid bar on the bottom of the screen. Moving in any direction uses fuel. Running out of fuel ends the game.

If your enemy gets wise to your gobble pattern, leave some "nuke-poo" in his path to slow him down. The more nuke-poo you leave for him, the longer he stays paralyzed when he eats it. To dispense nuke-poo, merely press the space bar. Note — leaving nuke-poo decreases your fuel.

(Martin S. Montes is a civil engineer working for the Army Corps of Engineers in Fort Worth. He currently heads a company called Assembly Lines Inc., a Dallas/Fort Worth firm that teaches individuals, in their own home or business, how to custom program their computers in BASIC*.)*

90 0158
180 ..... 032F
310 0518
END ... 0725

The listing:

```
10 CLS:PMODE 4,1:PCLS:SCREEN 1,1
20 CLEAR:DIM P(20,20),K$(4),B(20
,20): POKE 65495,0
30 K$(1)=CHR$(9):K$(2)=CHR$(94):
K$(3)=CHR$(8):K$(4)=CHR$(10)
40 X=8:Y=6:F=50
50 PCLS:IX=INT(256/(X+1)):IY=INT
(182/(Y+1))
60 LINE (3,3)-(252,3),PSET:LINE
-(252,178),PSET:LINE -(3,178),PS
ET:LINE -(3,3),PSET
70 LINE (20,182)-(20,190),PSET:L
INE -(F,190),PSET:LINE -(F,182),
PSET:LINE -(20,182),PSET:PAINT (
21,185),1
80 DZ=2+(X+Y)/10
90 N=X*Y
100 FOR I=1 TO X:FOR J=1 TO Y:CI
RCLE (IX*I,IY*J),3:B(I,J)=0:IF R
```

LINE	DESCRIPTION
10	Set up the high resolution mode
20	K$ array holds 4 arrow keys P matrix holds fuel units gained for landing on that spot. B matrix holds "nuke-poo" units dispensed at that spot.
30	Assign your arrow keys
40	Start with an 8 by 6 matrix & 50 fuel units.
50	Find out the pixel spacing between pills, (X & Y)
60	Draw screen border.
70	Draw fuel gauge strip.
80	Set dizziness factor for your opponent, higher the DZ, the faster he moves.
90	Find the starting number of pills.
100	Draw a fresh screen of pills and give some pills bonus fuel potential by letting P matrix equal RND(23).
120	Starting direction of your travel.
130	Starting location of you (X0 & Y0) and your opponent (X1 & Y1).
140	Make sure the starting distance between you and your opponent is not too close.
150	Draw both you and your opponent on the screen, paint your opponent a solid white.
160	Check if any fuel was gained on your last jump.
170	Increase fuel amount by number of fuel units in that pill, see if all pills have been eaten.
180	Assign present location (in pixels) to variables A & B.
190	Erase that fuel pill by painting it black.
200	Eat all that pill's fuel, decrease fuel gauge line by subroutine 210.
230	Get a key from the keyboard, if a space bar then leave "nuke-poo" at your present location (Increment B matrix).
240-270	Find out which arrow key was pressed.
280-310	Change present coordinates of yourself and check for possible wraparound.
320	Erase and redraw yourself at a new location.
330	Assign new pixel coordinate for enemy.
340	See if had any fuel under enemy (P Matrix)
350	Find direction (+, - or 0) of enemy, relative to your position on the screen.
360	See if your enemy swallowed too much "nuke-poo" and cannot move (GOTO 400)
370	See if enemy moves towards you in the X direction.
380	Or in the Y direction
390	Give enemy his new pixel coordinates.
400	Draw the enemy on the screen, fill him with white.
410	If any bonus fuel was under the enemy, reduce it to 1 fuel unit.
420	If your coordinates and your enemy's are the same, then you have been eaten.
430	See if enemy landed on some "nuke-poo", if so then decrease variable DZ, making him less active.
440	Make enemy a little more active, helps him recover from eating "nuke-poo."
450	Start next move.
460	End the game and score.

```
ND(X+Y)=1 THEN P(I,J)=RND(23):PA
INT (IX*I,IY*J),1:SOUND P(I,J)*1
0,1ELSE P(I,J)=1:PLAY"L220;A"
110 NEXTJ,I
120 DX=0:DY=0
130 X0=RND(X):Y0=RND(Y):X1=RND(X
):Y1=RND(Y)
140 IF ABS(X0-X1)<4 OR ABS(Y0-Y1
)<4 THEN 130
150 CIRCLE (X0*IX,Y0*IY),6:CIRCL
E (X1*IX,Y1*IY),7:PAINT (X1*IX+4
,Y1*IY),1:PAINT (X1*IX+4,Y1*IY),
0
160 IF P(X0,Y0)=0 THEN 180
170 FOR I=1 TO P(X0,Y0):PLAY "L1
70;"+STR$(INT(I/2+1)):F=F+1:LINE
(F,182)-(F,190),PSET:NEXT I:T=T+
P(X0,Y0):N=N-1:IF N=0 THEN X=X+1
:Y=Y+1:GOTO 50
180 A=X0*IX:B=Y0*IY
190 IF P(X0,Y0)<>0 THEN PAINT (A
,B),1: PAINT (A,B),0
```

```
200 P(X0,Y0)=0:GOSUB 210:GOTO220
210 LINE (F,182)-(F,190),PRESET:
F=F-1:PLAY"L150;C":IF F=19 THEN
PRINT@170,"OUT OF FUEL":GOTO 460
 ELSE RETURN
220 REM
230 A$=INKEY$:IF A$=" " THEN B(X
0,Y0)=B(X0,Y0)+3:PLAY"V30;L200;O
1;G":PSET(A+RND(5)-3,B+RND(5)-3)
:GOSUB 210:GOTO 230 ELSE IF A$="
" THEN 280
240 IF A$=K$(1) THEN DX=1:DY=0:G
OTO 280
250 IF A$=K$(2) THEN DY=-1:DX=0:
GOTO 280
260 IF A$=K$(3) THEN DX=-1:DY=0:
GOTO 280
270 IF A$=K$(4) THEN DY=1:DX=0
280 X0=X0+DX:IF X0=0 THEN X0=X
290 IF X0>X THEN X0=1
300 Y0=Y0+DY:IF Y0=0 THEN Y0=Y
310 IF Y0>Y THEN Y0=1
```

```
320 CIRCLE (A,B),6,0:CIRCLE (X0*
IX,Y0*IY),6
330 A=X1*IX:B=Y1*IY:PAINT (A+4,B
),0
340 IF P(X1,Y1)<>0 THEN CIRCLE (
A,B),3
350 EX=SGN(X0-X1):EY=SGN(Y0-Y1)
360 IF RND(DZ)<=1 THEN 400
370 IF RND(2)=1 THEN IF X1+EX>0
AND X1+EX<=X THEN X1=X1+EX:GOTO
390
380 IF Y1+EY>0 AND Y1+EY<=Y THEN
 Y1=Y1+EY
390 A=X1*IX:B=Y1*IY
400 CIRCLE (A,B),7:PAINT (A+4,B)
,1
410 IF P(X1,Y1)>0 THEN P(X1,Y1)=
1
420 IF X1=X0 AND Y1=Y0 THEN FOR
I=1 TO 1000:NEXT I:PRINT@266,"SO
RRY.....":SOUND 1,30: GOTO 460
430 IF B(X1,Y1)<>0 THEN FOR I=1
TO B(X1,Y1)*4:PLAY"L200;A":NEXTI
:DZ=DZ/B(X1,Y1):B(X1,Y1)=0
440 DZ=DZ+.1
450 GOTO 160
460 PRINT@325,"YOU SCORE"T"POINT
S!!!"
```

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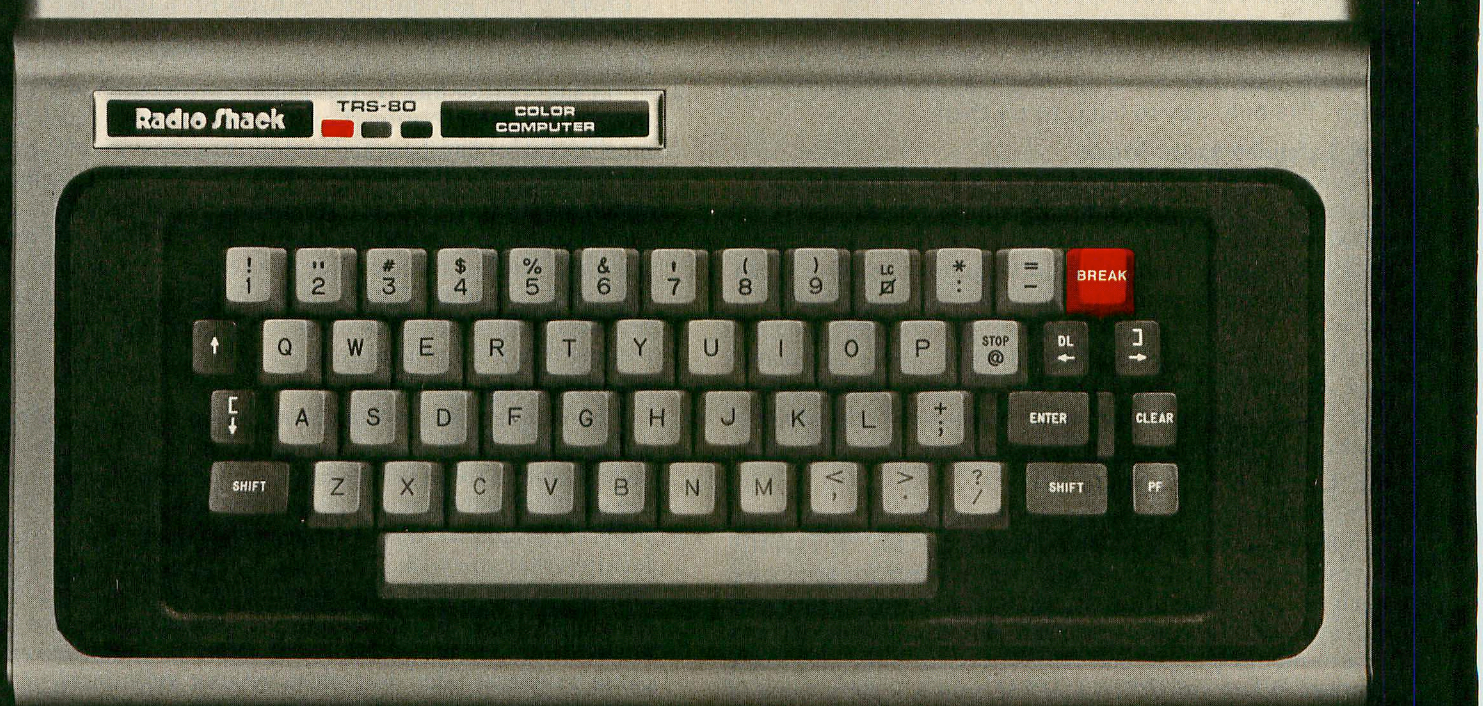

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A Bigger Byte

By Ray

Would you like another 8K of memory available from Extended BASIC? This machine language utility program relocates BASIC and Extended BASIC into the 64K RAM chips. Once this is done you have the choice of regular 32K or 40K RAM, Map 1.

This program will only work on a computer with the completed 64K upgrade and I don't think it will work with a disk system. The famous speed up (*POKE* 65495,0) will not work.

All BASIC and Extended BASIC commands will function normally; however, some machine language programs may crash. The only way to tell is to try them.

32K Extended BASIC Mode

If you choose the 32K mode, all BASIC and most, if not all, machine language programs will run as normal. Since the ROMs are now in RAM they can be altered. As an example, try *POKEing* different values into memory location 41384. This has an effect on the cursor. You might also try *POKEing* values into 41805 and then listing a program. You will find the screen scroll has been altered. Some commands have already been changed by the utility, more on this later. The 32K mode can be useful for making backup copies of ROM Packs since this area is also copied to the 64K chips.

40K Extended BASIC Mode

When this option is chosen, Extended BASIC is moved to high RAM starting at 57088 and ending at 65279. This still leaves the memory from 49152 to 57087 free for your own machine language utility use. BASIC RAM work-space now ends at 40960. This utility program changes all of the ROM's long branches, jumps, and tables to correspond to its new location. When you *PRINT MEM*, you will get a value of 33063, and after a *PCLEAR 1* command you should have 37671 bytes available. These values are 8192 bytes larger than normal, reflecting the new BASIC RAM work space. Some BASIC programs will have to be modified to utilize this additional memory, this usually means changing the *CLEAR* command by 8192.

Command Changes

The utility is set up to make three changes to the BASIC ROM routines. The first allows you to use the *PCLEAR 0* command. This keeps the BASIC program buffer intact and causes free memory to increase to 39207. If you then *CLEAR 0* you get another 200 bytes for a total of 39407, almost 40K. It should be noted that with the first graphics page now available for program storage, a *PCLS* statement, or for that matter any Hi-Res graphics command, will destroy your BASIC program. For this reason, this statement is most useful for database and non-hi-resolution graphic programs. The *CLOAD* command has been altered slightly. When an I/O error is encountered, the audio is no longer turned off automatically. This is to allow easier tape searches. The last change made to BASIC is in the working of the trace function, *TRON*. I have replaced the square brackets "[ ]" with minus signs "-". This change makes the reading of a trace much easier.

Machine Language Utility

This program was written using Radio Shack's excellent *EDTASM+* ROM Pak. You should be able to enter the code (Listing 1) with other editor/assemblers as long as they use standard 6809 mnemonics and assembler directives. The program originates at 31744, but can be re-assembled to any location that you wish. This code is not position independent. Save the source code for further reference and the assembled code for immediate use. Be sure there are no errors or omissions. A small error could go unnoticed and cause problems later. For those without assemblers, enter the BASIC code (Listing 2) and run it. Follow the instructions for saving the completed ML code. This is what you will later *CLOADM* and *EXEC*. When the utility is executed, any BASIC programs in memory are deleted, as this is the same as a cold start power up.

(For the past 17 years, Ray has been involved in the performing and visual arts as a professional musician and a studio potter. Three years ago he caught the computer bug and is now taking a computer engineering course at Sault College.)

Listing 1:

```
7C00                 00100           ORG $7C00
7C00 BD    A928      00200 CLS       JSR $A928
```

64K
ECB

For Basic

Gauvreau

```
                00300 *ROM TO RAM MOVE
                00400
7C03 1A   50    00500         ORCC ##50
7C05 8E   8000  00600         LDX #$8000
7C08 EC   84    00700 ROMV    LDD ,X
7C0A B7   FFDF  00800         STA $0FFDF
7C0D ED   81    00900         STD ,X++
7C0F B7   FFDE  01000         STA $0FFDE
7C12 8C   FEFE  01100         CMPX #$0FEFE
7C15 26   F1    01200         BNE ROMV
7C17 B7   FFDF  01300         STA $0FFDF
                01400 *SET TO ALLOW PCLEAR0
                01500
7C1A CC   1212  01600         LDD #$1212
7C1D FD   968F  01700         STD $968F
7C20 FD   96A3  01800         STD $96A3
7C23 FD   96A5  01900         STD $96A5
                02000 *DISABLE AUDIOOFF ON ERR
                02100
7C26 FD   AC4F  02200         STD $AC4F
7C29 B7   AC51  02300         STA $AC51
                02400 *CHANGE TRON [] TO -
                02500
7C2C 86   2D    02600         LDA #$2D
7C2E B7   82E3  02700         STA $82E3
7C31 B7   82ED  02800         STA $82ED
                02900 *CHANGE EX-BASIC HEADING
                03000
7C34 8E   7DD7  03100         LDX #MESSG
7C37 108E 80E8  03200         LDY #$80E8
7C3B A6   80    03300 CHEAD   LDA ,X+
7C3D 27   04    03400         BEQ RAMRAM
7C3F A7   A0    03500         STA ,Y+
7C41 20   F8    03600         BRA CHEAD
                03700 *DECIDE ON 32K OR 40K
                03800
7C43 108E 7E2A  03900 RAMRAM  LDY #QUEST
7C47 A6   A0    04000 PQUE    LDA ,Y+
7C49 27   06    04100         BEQ GETA
7C4B AD   9F A002 04200       JSR [$A002]
7C4F 20   F6    04300         BRA PQUE
7C51 AD   9F A000 04400 GETA  JSR [$A000]
7C55 27   FA    04500         BEQ GETA
7C57 BD   A928  04600         JSR $A928
7C5A 81   31    04700         CMPA #$31
7C5C 27   0C    04800         BEQ FKRAM
7C5E 81   32    04900         CMPA #$32
7C60 26   E1    05000         BNE RAMRAM
                05100 *32K JUMP
                05200
7C62 8E   0000  05300         LDX #$0
7C65 1C   AF    05400         ANDCC #$AF
7C67 7E   8002  05500         JMP $8002
                05600 *40K  LOOP TO RELOCATE RAM
7C6A 8E   3430  05700 FKRAM   LDX #$3430
7C6D BF   80E8  05800         STX $80E8
7C70 8E   8000  05900         LDX #$8000
7C73 108E DF00  06000         LDY #$DF00
7C77 EC   84    06100 MLOOP   LDD ,X
7C79 6F   81    06200         CLR ,X++
7C7B ED   A1    06300         STD ,Y++
7C7D 8C   A000  06400         CMPX #$A000
7C80 26   F5    06500         BNE MLOOP
                06600 *RESET 2 DISPATCH TABLES
                06700
7C82 8E   E0F0  06800 DISPT1  LDX #$0E0F0
7C85 A6   84    06900 DLOOP1  LDA ,X
7C87 8B   5F    07000         ADDA #$5F
7C89 A7   81    07100         STA ,X++
7C8B 8C   E11E  07200         CMPX #$0E11E
7C8E 26   F5    07300         BNE DLOOP1
7C90 8E   E157  07400 DISPT2  LDX #$0E157
7C93 A6   84    07500 DLOOP2  LDA ,X
7C95 8B   5F    07600         ADDA #$5F
7C97 A7   81    07700         STA ,X++
7C99 8C   E173  07800         CMPX #$0E173
```

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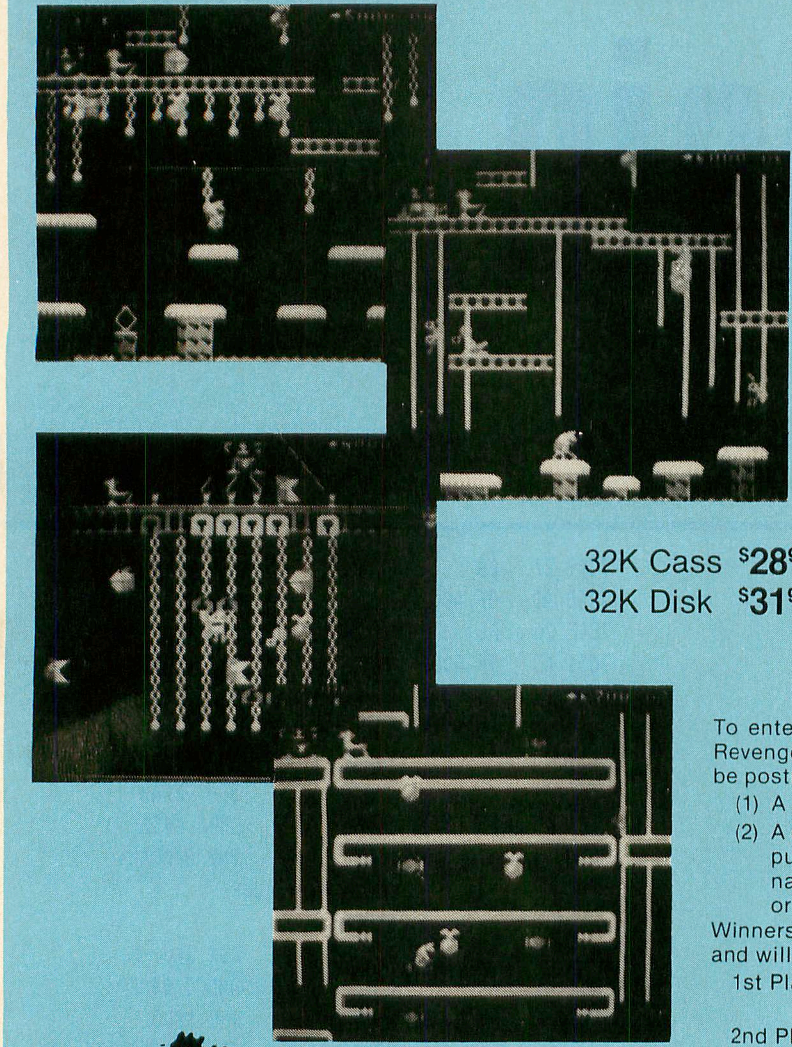

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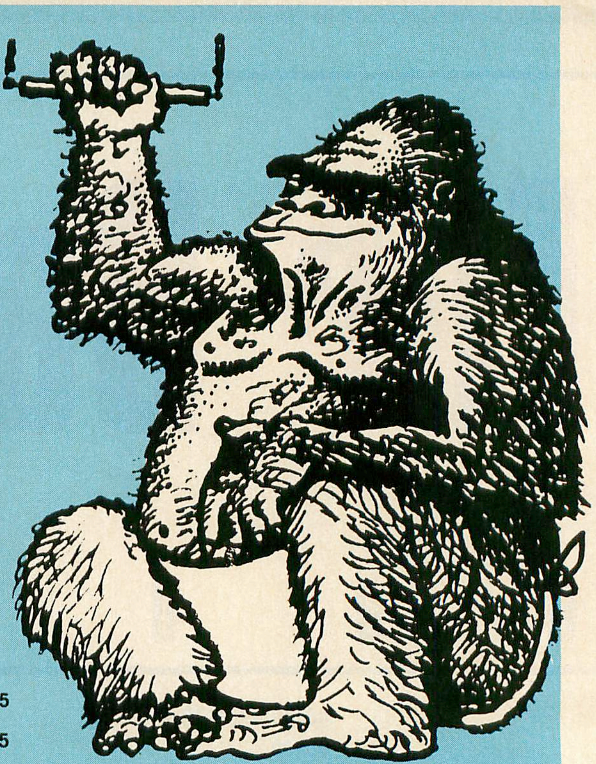

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```
7C9C 26   F5     07900          BNE DLOOP2
                 08000 *MAIN TO CHNG ADDRESSES
                 08100
7C9E 8E   DF00   08200 CHNG     LDX #$DF00
7CA1 108E 7D33   08300          LDY #LIST
7CA5 A6   80     08400 CLOOP    LDA ,X+
7CA7 81   8E     08500          CMPA #$8E
7CA9 27   2B     08600          BEQ INIT
7CAB 81   BD     08700          CMPA #$0BD
7CAD 27   27     08800          BEQ INIT
7CAF 81   CE     08900          CMPA #$0CE
7CB1 27   23     09000          BEQ INIT
7CB3 81   7E     09100          CMPA #$7E
7CB5 27   1F     09200          BEQ INIT
7CB7 81   11     09300          CMPA #$11
7CB9 27   15     09400          BEQ SPECL
7CBB 8C   FEFF   09500 COMMON   CMPX #$FEFF
7CBE 27   0E     09600          BEQ ENDPRT
7CC0 AC   A4     09700          CMPX ,Y
7CC2 26   E1     09800          BNE CLOOP
7CC4 31   22     09900          LEAY 2,Y
7CC6 30   B4     10000          LEAX [,Y]
7CC8 31   22     10100          LEAY 2,Y
7CCA 30   01     10200          LEAX 1,X
7CCC 20   D7     10300          BRA CLOOP
7CCE 20   16     10400 ENDPRT   BRA LONBR
                 10500 *SPECIAL CASES
                 10600
7CD0 A6   80     10700 SPECL    LDA ,X+
7CD2 81   83     10800          CMPA #$83
7CD4 26   E5     10900          BNE COMMON
7CD6 A6   84     11000 INIT     LDA ,X
7CD8 81   80     11100          CMPA #$80
7CDA 25   DF     11200          BLO COMMON
7CDC 81   9F     11300          CMPA #$9F
7CDE 22   DB     11400          BHI COMMON
7CE0 8B   5F     11500          ADDA #$5F
7CE2 A7   81     11600          STA ,X++
7CE4 20   D5     11700          BRA COMMON
                 11800 *CHNG LONG BR OFFSETS
                 11900
7CE6 8E   7D59   12000 LONBR    LDX #LTABLE
7CE9 86   5F     12100          LDA #$5F
7CEB B7   7D32   12200          STA TEMPO
7CEE 70   7D32   12300 NEG      NEG TEMPO
7CF1 A6   94     12400 LBROOP   LDA [,X]
7CF3 BB   7D32   12500          ADDA TEMPO
7CF6 A7   94     12600          STA [,X]
7CF8 30   02     12700          LEAX 2,X
7CFA 8C   7DA3   12800          CMPX #2+MIDTBL
7CFD 27   EF     12900          BEQ NEG
7CFF 8C   7DD7   13000          CMPX #2+ENDTBL
7D02 26   ED     13100          BNE LBROOP
                 13200 *MOP UP A000 BASIC ROM
                 13300
7D04 8E   A0D1   13400          LDX #$A0D1
7D07 86   7E     13500          LDA #$7E
7D09 A7   80     13600          STA ,X+
7D0B CC   DF02   13700          LDD #$0DF02
7D0E ED   84     13800          STD ,X
```

```
7D10 86   9F     13900          LDA #$9F
7D12 B7   BC85   14000          STA $BC85
7D15 8E   A084   14100          LDX #$A084
7D18 CC   8E9F   14200          LDD #$8E9F
7D1B ED   81     14300          STD ,X++
7D1D CC   FE7E   14400          LDD #$FE7E
7D20 ED   81     14500          STD ,X++
7D22 CC   A093   14600          LDD #$A093
7D25 ED   84     14700          STD ,X
7D27 4F          14800          CLRA
7D28 97   71     14900          STA $71
                 15000 *40K JUMP
                 15100
7D2A 8E   0000   15200          LDX #$0
7D2D 1C   AF     15300          ANDCC #$AF
7D2F 7E   A027   15400          JMP $A027
                 15500
                 15600 *MAIN PROGRAM END IS HERE
                 15700
7D32             15800 TEMPO    RMB $01
                 15900 *LIST OF AREAS TO SKIPP
                 16000
7D33      DFDA   16100 LIST     FDB $0DFDA
7D35      E03B   16200          FDB $0E03B
7D37      E083   16300          FDB $0E083
7D39      E173   16400          FDB $0E173
7D3B      E2AB   16500          FDB $0E2AB
7D3D      E346   16600          FDB $0E346
7D3F      E3C4   16700          FDB $0E3C4
7D41      E3F1   16800          FDB $0E3F1
```

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```
7D43      E80B      16900            FDB $0E80B
7D45      E80F      17000            FDB $0E80F
7D47      F1DD      17100            FDB $0F1DD
7D49      F1E5      17200            FDB $0F1E5
7D4B      F606      17300            FDB $0F606
7D4D      F60E      17400            FDB $0F60E
7D4F      FB5B      17500            FDB $0FB5B
7D51      FBB6      17600            FDB $0FBB6
7D53      FD79      17700            FDB $0FD79
7D55      FDA0      17800            FDB $0FDA0
7D57      FEFF      17900            FDB $0FEFF
                    18000 *LIST OF LONG BRANCHES
                    18100
7D59      DFAE      18200 LTABLE     FDB $DFAE
7D5B      E0FA      18300            FDB $E0FA
7D5D      E220      18400            FDB $E220
7D5F      E232      18500            FDB $E232
7D61      E24F      18600            FDB $E24F
7D63      E29E      18700            FDB $E29E
7D65      E34B      18800            FDB $E34B
7D67      E379      18900            FDB $E379
7D69      E3C1      19000            FDB $E3C1
7D6B      E441      19100            FDB $E441
7D6D      E4FC      19200            FDB $E4FC
7D6F      E704      19300            FDB $E704
7D71      E73A      19400            FDB $E73A
7D73      E7EA      19500            FDB $E7EA
7D75      E872      19600            FDB $E872
7D77      EB40      19700            FDB $EB40
7D79      EB68      19800            FDB $EB68
7D7B      EB79      19900            FDB $EB79
7D7D      EBAF      20000            FDB $EBAF
7D7F      EBE8      20100            FDB $EBE8
7D81      EC8B      20200            FDB $EC8B
7D83      EEA9      20300            FDB $EEA9
7D85      F220      20400            FDB $F220
7D87      F293      20500            FDB $F293
7D89      F2E4      20600            FDB $F2E4
7D8B      F314      20700            FDB $F314
7D8D      F31A      20800            FDB $F31A
7D8F      F35C      20900            FDB $F35C
7D91      F461      21000            FDB $F461
7D93      F7DB      21100            FDB $F7DB
7D95      F8C8      21200            FDB $F8C8
7D97      F8D5      21300            FDB $F8D5
7D99      F941      21400            FDB $F941
7D9B      F9D8      21500            FDB $F9D8
7D9D      FB45      21600            FDB $FB45
7D9F      FE03      21700            FDB $FE03
7DA1      FE3F      21800 MIDTBL     FDB $FE3F
                    21900 *THESE TO BE INCREASED
                    22000
7DA3      DFDF      22100            FDB $0DFDF
7DA5      DFE1      22200            FDB $0DFE1
7DA7      DFE6      22300            FDB $0DFE6
7DA9      DFE4      22400            FDB $0DFE4
7DAB      F19C      22500            FDB $0F19C
7DAD      F19E      22600            FDB $0F19E
7DAF      F1A0      22700            FDB $0F1A0
7DB1      F1A2      22800            FDB $0F1A2
7DB3      F1A4      22900            FDB $0F1A4
7DB5      F38A      23000            FDB $0F38A
7DB7      F38C      23100            FDB $0F38C
7DB9      F38E      23200            FDB $0F38E
7DBB      F390      23300            FDB $0F390
7DBD      F392      23400            FDB $0F392
7DBF      E37B      23500            FDB $0E37B
7DC1      F739      23600            FDB $0F739
7DC3      F73B      23700            FDB $0F73B
7DC5      F73E      23800            FDB $0F73E
7DC7      F740      23900            FDB $0F740
7DC9      F743      24000            FDB $0F743
7DCB      F745      24100            FDB $0F745
7DCD      F748      24200            FDB $0F748
7DCF      F74A      24300            FDB $0F74A
7DD1      F74D      24400            FDB $0F74D
7DD3      F74F      24500            FDB $0F74F
7DD5      FC11      24600 ENDTBL     FDB $0FC11
                    24700 *THINGS FOR THE SCREEN
                    24800
7DD7      33        24900 MESSG      FCC /32K ROM-RAM/
7DE2      0D0D      25000            FDB $0D0D
7DE4      56        25100            FCC /VERSION 1.1 1983 BY
                                               RAY GAUVREAU/
7E04      45        25200            FCC /EXTENDED BASIC  /
7E14      0D        25300            FCB $0D
7E15      4E        25400            FCC /NOW IN 64K RAM MODE/
7E28      0D        25500            FCB $0D
7E29      00        25600            FCB $0
7E2A      50        25700 QUEST      FCC /PRESS   1  FOR 40K
                                                  2  FOR 32K/
7E4A      00        25800 FINS       FCB $0
          0000      25900            END
```

110.....01FA
180.....05E3
END ... 0838

Listing 2:

```
10 CLS:PRINT" ONE MOMENT PLEASE"
20 FOR G=31744 TO 32330
30 READ P$:P=VAL("&H"+P$)
32 PRINT@32,G,P$
40 POKE G,P
50 NEXT G:CLS
60 PRINT"NOW TO SAVE THE PROGRAM
 TYPE"
70 PRINT"CSAVEM";CHR$(34);"FORTY
K";CHR$(34);",31744,32330,31744"
80 PRINT"TO RUN IT TYPE  EXEC317
44"
90 'DATA IN HEX
100 DATABD,A9,28,1A,50,8E,80,00,
EC,84,B7,FF,DF,ED,81,B7,FF,DE,8C
,FE,FE,26,F1,B7,FF,DF,CC,12,12,F
D,96,8F,FD,96,A3,FD,96,A5,FD,AC,
4F,B7,AC,51,86,2D,B7,82,E3,B7,82
,ED,8E,7D,D7,10,8E,80,E8,A6,80,2
7,04,A7,A0,20,F8,10,8E,7E,2A,A6,
A0,27,06,AD,9F,A0,02,20
110 '
```

```
120 DATAF6,AD,9F,A0,00,27,FA,BD,
A9,28,81,31,27,0C,81,32,26,E1,8E
,00,00,1C,AF,7E,80,02,8E,34,30,B
F,80,E8,8E,80,00,10,8E,DF,00,EC,
84,6F,81,ED,A1,8C,A0,00,26,F5,8E
,E0,F0,A6,84,8B,5F,A7,81,8C,E1,1
E,26,F5,8E,E1,57,A6,84,8B,5F,A7,
81,8C,E1,73,26,F5,8E,DF
130 '
140 DATA00,10,8E,7D,33,A6,80,81,
8E,27,2B,81,BD,27,27,81,CE,27,23
,81,7E,27,1F,81,11,27,15,8C,FE,F
F,27,0E,AC,A4,26,E1,31,22,30,84,
31,22,30,01,20,D7,20,16,A6,80,81
,83,26,E5,A6,84,81,80,25,DF,81,9
F,22,DB,8B,5F,A7,81,20,D5,8E,7D,
59,86,5F,B7,7D,32,70,7D
150 '
160 DATA32,A6,94,BB,7D,32,A7,94,
30,02,8C,7D,A3,27,EF,8C,7D,D7,26
,ED,8E,A0,D1,86,7E,A7,80,CC,DF,0
2,ED,84,86,9F,B7,BC,85,8E,A0,84,
CC,8E,9F,ED,81,CC,FE,7E,ED,81,CC
,A0,93,ED,84,4F,97,71,8E,00,00,1
C,AF,7E,A0,27,00,DF,DA,E0,3B,E0,
83,E1,73,E2,AB,E3,46,E3
170 '
180 DATAC4,E3,F1,E8,0B,E8,0F,F1,
DD,F1,E5,F6,06,F6,0E,FB,5B,FB,B6
,FD,79,FD,A0,FE,FF,DF,AE,E0,FA,E
2,20,E2,32,E2,4F,E2,9E,E3,4B,E3,
79,E3,C1,E4,41,E4,FC,E7,04,E7,3A
,E7,EA,E8,72,EB,40,EB,68,EB,79,E
B,AF,EB,E8,EC,8B,EE,A9,F2,20,F2,
93,F2,E4,F3,14,F3,1A,F3
190 '
200 DATA5C,F4,61,F7,DB,F8,C8,F8,
D5,F9,41,F9,D8,FB,45,FE,03,FE,3F
,DF,DF,DF,E1,DF,E6,DF,E4,F1,9C,F
1,9E,F1,A0,F1,A2,F1,A4,F3,8A,F3,
8C,F3,8E,F3,90,F3,92,E3,7B,F7,39
,F7,3B,F7,3E,F7,40,F7,43,F7,45,F
7,48,F7,4A,F7,4D,F7,4F,FC,11,33,
32,4B,20,52,4F,4D,2D,52
210 '
220 DATA41,4D,0D,0D,56,45,52,53,
49,4F,4E,20,31,2E,31,20,31,39,38
,33,20,42,59,20,52,41,59,20,47,4
1,55,56,52,45,41,55,45,58,54,45,
4E,44,45,44,20,42,41,53,49,43,20
,20,0D,4E,4F,57,20,49,4E,20,36,3
4,4B,20,52,41,4D,20,4D,4F,44,45,
0D,00,50,52,45,53,53,20
230 '
240 DATA20,20,31,20,20,46,4F,52,
20,34,30,4B,20,20,20,20,32,20,20
,46,4F,52,20,33,32,4B,00
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COLOR-EYED-O-SCOPE

By Terrell Touchstone

Were you as disappointed as I in the kaleidoscope program in *Getting Started With Color* BASIC? And in the other pattern programs that have appeared from time to time? Here is one that I think you will find more dynamically faithful to the ole' kaleidoscope. And while this endless display of colorful patterns demonstrates the Color Computer's capabilities, it can also be quite practical. For one thing, the display is an excellent attention getter for store windows and selling booths. Secondly, if it is necessary for you to leave your monitor or TV set on and unattended for long periods of time, this program will be useful in preventing "burn-in" on your tube.

The program is elementary. It uses the *SET* statement to randomly place a pair of mirror-image color blocks in each of four quadrants. What makes the patterns interesting to watch is the manner in which the *RND* function is orchestrated to select color, duration and foldback of the pattern streamers. You might try playing with the *RND* statements in Lines 100, 221 and 300 to get different dynamics.

As it is, the code will run on any Color Computer beginning with 4K Color BASIC, and it is easily adapted to any other machine. To try it, simply type it in and *RUN*. To increase the speed, try the *POKE 65495,0*. Don't fail to step back and view it from across the room.

(Terrell Touchstone has a Ph.D. in chemical engineering and fifteen years of experience in the field of computer process control. He is currently employed with Chevron in Richmond, California)

The listing:

```
1 ' ### COLOR-EYED-O-SCOPE ###
2 ' BY  TERRELL TOUCHSTONE
3 '
4 '  INITIALIZE
20 CLS0
30 D1=0:D3=1:D4=1
40 A=RND(4):B=RND(10)
50 GOTO225
90 ' MAIN LOOP
100 IF RND(0)>.6 GOTO 210
208 DA=RND(2):DB=RND(3)
210 A=A-DA+D3:B=B-DB+D4
221 IF RND(0)>.2 GOTO 230
225 CL=RND(8)
230 IF ABS(A)>15 OR ABS(B)>15 OR
 D1>8 GOTO 300
232 IF ABS(A) <= 12 GOTO 235
233 D3=-D3:D1=D1+1
235 IF ABS(B) > 12 THEN D4=-D4
250 SET(31+2*A,15+B,CL)
255 SET(31+2*A,15-B,CL)
260 SET(31-2*A,15-B,CL)
265 SET(31-2*A,15+B,CL)
270 SET(31+2*B,15+A,CL)
275 SET(31+2*B,15-A,CL)
280 SET(31-2*B,15-A,CL)
285 SET(31-2*B,15+A,CL)
290 GOTO 100
300 IF RND(3)>1 GOTO 30
320 FOR K=1 TO 4000:NEXT K
330 CLS0
350 GOTO 30
```

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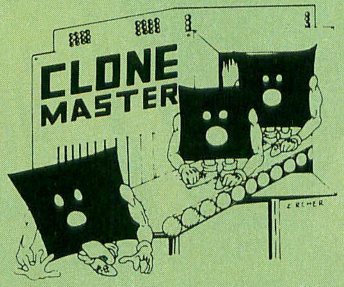
A breakthrough in programming utilities from the author of Colorkit! You may need a little background for this program. The first time you mention a variable in a BASIC program, the computer assigns a space in the variable table in memory. It starts at the bottom of the table and works up to the top, and the next time that variable is called in your program the computer goes to the variable table to look it up. The search starts at the bottom of the table and continues until the variable is located. This takes time, and the farther up the table the variable is located, the longer it takes. There is a BIG SPEED ADVANTAGE in having the most frequently called variable located first in the table, with the next most frequently called variable second, etc. This program simply examines your BASIC program while it is running and then actually modifies it to speed it up! Speed increase will be from 5% to 75%, depending upon the program, and we include a list of other tips to speed up execution even more. This program will also print a list of the variables used in the program and tell you how many times each is called. VARALYZER is 100% machine language and REQUIRES 64K to run. Works fine on either disk or tape systems. **$24.95**

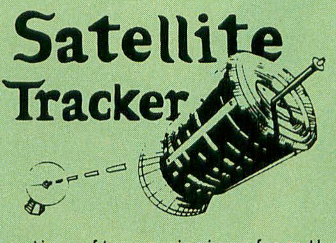


Clone Master

This is the ultimate disk backup utility, and who else but Prickly-Pear, originators of Omni-Clone, could bring it to you. If you are tired of waiting for your BACKUP command to finish, you'll like the speed of CLONE MASTER. This program checks the computer memory size, and if you have a 64K machine it will do a backup on a full disk in about 7 minutes — including formatting the destination disk — with only THREE swaps, not the seven you are used to, and if you are running multiple drives, CLONE MASTER will handle up to 4 double-sided drives. In addition, although we can't guarantee that CLONE MASTER will back up any disk, it can handle backups of any non-standard (protected) disk we have seen — not only on the Color Computer, but on Model III and IV, IBM PC, Kaypro, Osborne, and Atari. It handles up to 256 tracks, single and double density — even on the same track, CRC errors, and lots more. It even checks the speed of your drives for you! If you are using a disk drive, you know how disks will crash, so don't leave your valuable software unprotected any longer. Back it up or lose it! CLONE MASTER will adjust to any memory size and works with any version of the ROM's — including the JVC controller. **$39.95**

Erland

The most complex simulation we have ever seen, and you VIKING! fans will want to take note. This game has you running a small holding in old Ireland. You must manage your land, sheep, army, markets, fishing fleets, taxes, and many other factors while you try to rise in rank to become King or Queen. You may attack — or be attacked — by the other players, and you will have to face the fact that there isn't enough land to go around, and you may have to take some away from someone else! This 32K game is considerably more complex and difficult than our super popular VIKING! Because of this, we have added a save-the-game feature. ERLAND is for 2 to 5 game lovers, and will warm the heart of anyone who liked VIKING!, Monopoly, or other classic strategy games. This game is a hybrid of Extended Basic and Machine language. The disk and tape versions are not interchangable. **Tape — $24.95; Disk — $29.95**



Satellite Tracker

If you are interested in reception of transmissions from the television satellites, you will need this program. It does all calculations associated with planning and setting up a satellite dish antenna. It figures antenna gain, signal to noise, aiming point for any geosyncronous satellite, effect of various quality amplifiers, and a lot more. The program will tell you whether a dish is practical in your location, how big it needs to be, and what kind of picture quality and signal strength you will achieve. If you are thinking of investing in a system, don't make a move until the results are in. Requires 32K extended BASIC and some (limited) knowledge of satellite terms and language. **$79.95**

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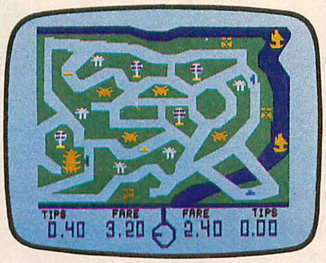

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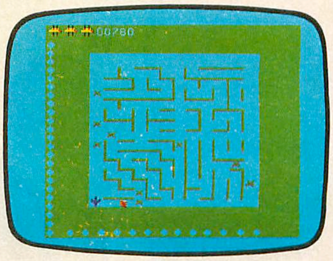

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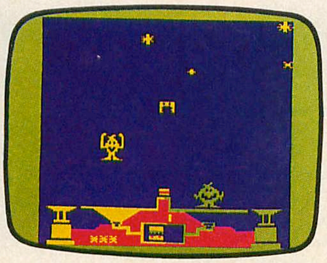

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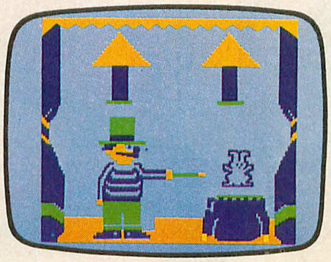

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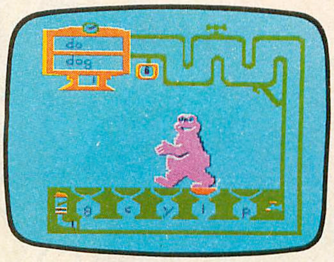

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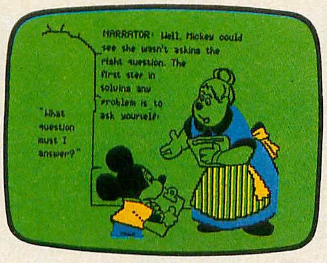

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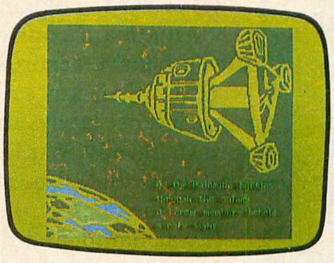

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16K
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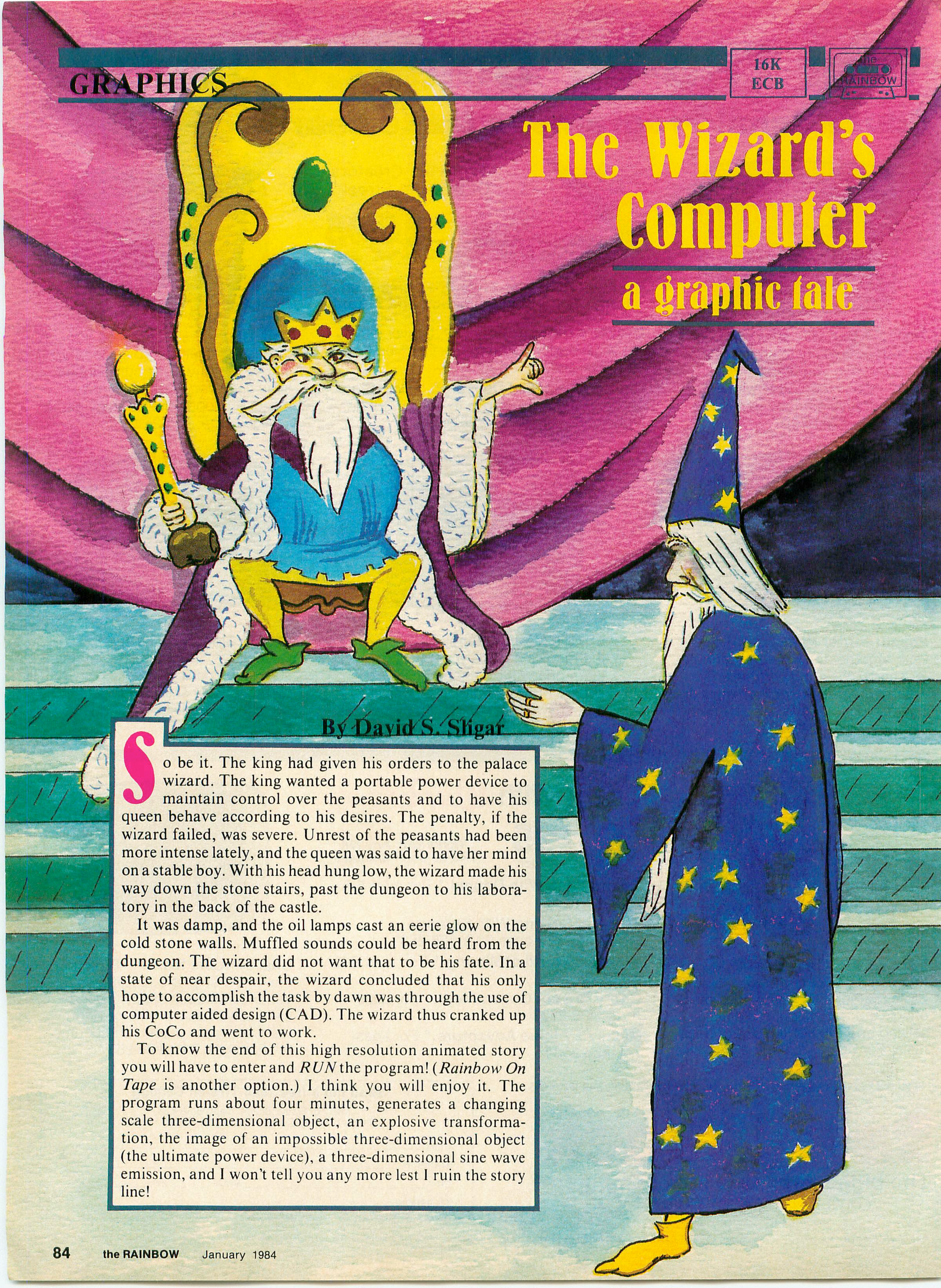

The Wizard's Computer

a graphic tale

By David S. Sligar

So be it. The king had given his orders to the palace wizard. The king wanted a portable power device to maintain control over the peasants and to have his queen behave according to his desires. The penalty, if the wizard failed, was severe. Unrest of the peasants had been more intense lately, and the queen was said to have her mind on a stable boy. With his head hung low, the wizard made his way down the stone stairs, past the dungeon to his laboratory in the back of the castle.

It was damp, and the oil lamps cast an eerie glow on the cold stone walls. Muffled sounds could be heard from the dungeon. The wizard did not want that to be his fate. In a state of near despair, the wizard concluded that his only hope to accomplish the task by dawn was through the use of computer aided design (CAD). The wizard thus cranked up his CoCo and went to work.

To know the end of this high resolution animated story you will have to enter and *RUN* the program! (*Rainbow On Tape* is another option.) I think you will enjoy it. The program runs about four minutes, generates a changing scale three-dimensional object, an explosive transformation, the image of an impossible three-dimensional object (the ultimate power device), a three-dimensional sine wave emission, and I won't tell you any more lest I ruin the story line!

This program demonstrates the dramatic effects which can be achieved on the CoCo by rapid high resolution screen switching. The program utilizes the high speed *POKE* 65495,0 and normal speed *POKE* 65494,0 to speed up the plotting of the 3-D sine wave. Let's take a look at how the program uses some of the CoCo's graphics commands.

The *PCLEAR8* statement in Line 730 reserves all eight of the 1536-byte graphics memory pages. The placement of this statement at the end of the program may seem somewhat odd. The program runs from Line 60 to the *PCLEAR8* in Line 730 and then back to Line 70 via *GOTO* statements. This odd arrangement is good programming practice due to an obscure error in the 1.0 Extended BASIC ROM. A valid *PCLEAR* statement placed in the early part of a program may produce an error message or program halt if your program exceeds a certain length. This erroneous error message is avoided by the above practice. The program graphics setup gets underway in Line 50 which specifies *PMODE4,1*. This high resolution *PMODE4* (256 x 192 graphics grid) requires four of the 1536-byte graphics memory pages for a full screen display. Thus with *PCLEAR8* and *PMODE4*, you have two full screen displays available. The first screen starts on Page 1 (*PMODE4,1*) and the second screen starts on Page 5 (*PMODE4,5*). Remember that the *PMODE* statement takes the form *PMODE* (resolution mode, start page).

After you have set up your *PMODE* and set aside the needed number of graphics pages with *PCLEAR*, a *PCLS* statement (as in Line 70) will clear the screen of any garbage or unwanted graphics in the current screen video RAM pages. The *SCREEN1,1* statement in Line 70 tells the computer you want to show a graphics screen rather than the prior text screen, and you want the screen to be black and buff. Remember that a *SCREEN* statement takes the form *SCREEN* (type, color set).

At this point, we have set the stage, and the real program action begins. Lines 80 through 140 use the scale function available in the *DRAW* statement to create a changing scale cube. Notice that the scale value must be converted from a numeric expression to a character string expression through the *STR$* function in order to be accepted by the *DRAW* statement. The scale function in the *DRAW* statement will not affect or scale parts of graphics put on the screen through other graphics statements, such as *LINE* or *CIRCLE*.

Lines 160 through 240 open the cube. Lines 250 through 290 create the explosive transformation. Lines 330 through 410 create the ultimate power device (an illusion). Lines 420 through 580 plot the 3-D sine wave. The most dramatic graphic effects of the program are created by the high speed screen switching produced in Lines 660 through 700. Everything really comes apart!

When you run this program, notice how various techniques to display the graphics are used.

In some cases, the graphics are drawn on the screen while you are watching. In other cases, the graphics are drawn on pages not currently shown, and then brought to the screen after the graphics are complete. In the case of the 3-D sine wave, the first wave is plotted while the prior screen is displayed, but the remaining waves are plotted while you watch. How and when your graphics are brought to the screen depends on your placement of *PMODE* and *SCREEN* statements within your programs.

(David Sligar has published a graphics program for a mainframe, but is presenty working on a financial analysis program for construction contractors for the CoCo. His hobbies include writing software.)

NOTE: If you add spaces when you type this program, it will not fit in 16K.

```
130..... 0150
280..... 02B6
390..... 0512
570..... 066B
END ... 0824
```

The listing:

```
10 CLS4:PRINT@128,"COLOR CAD"
15 PRINT@224,"THE IMPOSSIBLE OBJ
ECT"
20 PRINT@320,"BY DAVID SLIGAR":F
ORX=1TO999:NEXTX
30 CLS3:PRINT@192,"GOOD THINGS..
."
40 PRINT@256,"COME IN SMALL BOXE
S":FORX=1TO999:NEXTX
50 PMODE4,1
60 GOTO730
70 PCLS0:SCREEN1,1
80 FORZ=1TO8
90 IF Z=8 THEN FORZ=8TO4 STEP-1
100 PCLS0
110 S$="S"+STR$(Z)+";"
120 DRAW S$+";BM100,100U30NR30E1
5R30NG15D30G15NU30L30"
130 FORX=1TO120:NEXTX
140 NEXTZ
150 FORX=1TO400:NEXTX
160 PCLS:DRAW"BM100,100U30NR30E2
0R30G20D30NL30F20L30H20"
170 LINE(100,100)-(70,95),PSET
180 LINE-(70,65),PSET
190 LINE-(100,70),PSET
200 LINE(70,95)-(40,65),PSET,B
210 LINE(130,100)-(160,95),PSET
220 LINE-(160,65),PSET
230 LINE-(130,70),PSET
240 FORX=1TO600:NEXTX
250 CLS8:PRINT@224,"          KA
-BOOM!!!":FORX=1TO200:NEXTX
260 PCLS0:SCREEN1,1
270 FORN=1TO101 STEP5:CIRCLE(126
,95),N:NEXTN
280 FORN=101TO1 STEP-5:CIRCLE(12
6,95),N,0:NEXTN
290 PCLS:FORN=1TO50:S=RND(255):S
OUNDS,1:LINE(126,95)-(S,RND(195)
),PSET:NEXTN
300 CLS0:PRINT@192,"AS THE DUST
SETTLES,"
310 PRINT@256,"THE WIZARD'S WORK
 IS REVEALED."
```

```
320 PRINT@320,"THE ULTIMATE POWE
R DEVICE!!!":FORX=1TO2000:NEXTX
330 PCLS:DRAW"BM 55,156;R150;U10
;BH40;BL10;L140;D10;R125;F20;L12
5;U10;R105;F10;BM 55,156;U10;R14
0;BR10;U78;D10;BL10;D68;H40;U28;
D28;F40;BR10;U68;BL10;"
340 CIRCLE(55,151),3,5,2
350 CIRCLE(35,131),3,5,2
360 CIRCLE(15,111),3,5,2
370 DRAW"BM 55,78;R140;BR10;U10;
H40;L150;D10;R125;F20;L125;U10;R
105;F10;BM 55,78;U10;R150;"
380 DRAW"BM 205,156;U40;C0;U10;C
5;R20;H19;F19;U38;R10;L10;H40;D1
8;U18;R10;F40;D90;L10;H19;F19;U4
2;L20;"
390 CIRCLE(55,73),3,5,2
400 CIRCLE(35,53),3,5,2
410 CIRCLE(15,33),3,5,2
420 SCREEN1,1:PMODE4,5:PCLS0
430 POKE65495,0
440 PI=3.14159:Q=1
450 A=-4*PI:B=4*PI:N=360:R=20
460 IF Q>=1 THEN R=R+Q
470 X=(B-A)/N
480 F=255/(B-A)
490 FOR I=A TO B STEP X
500 X=I*F:Y=R*SIN(I+Q)
510 PSET((X+140),(80+Y),1)
520 NEXTI
530 Q=Q+7
540 CLS0:IF Q=8 THEN PRINT@224,"
BEGIN WAVE FORM GENERATION":FORX
=1TO900:NEXTX
550 SCREEN1,1
560 IF Q>56 GOTO580
570 GOTO450
580 POKE65494,0
590 CLS0:PRINT@224,"WARNING-EXCE
SSIVE ENERGY LEVEL":FORX=1TO900:
NEXTX
600 CLS4:PRINT@96,"        ALERT!
 ALERT!"
610 FORX=1TO5:SOUND156,3:SOUND92
,2:NEXTX
620 PRINT@128,"THERMAL RUNAWAY C
ONDITIONS!"
630 PRINT@192,"DEVICE OVERLOAD!!
"
640 PRINT@256,"SPONTANEOUS EMISS
IONS EXPECTED!"
650 PRINT@320,"DISINTEGRATION AL
ERT!!!":FORX=1TO2500:NEXTX
660 FORS=1TO100
670 PMODE4,1:SCREEN1,1:FORX=1TO5
0:NEXTX
680 IF S=50 THEN PCLS0:GOSUB720
690 PMODE4,5:SCREEN1,1:FORX=1TO5
0:NEXTX
700 NEXTS
710 GOTO10
720 FORN=1TO91 STEP5:CIRCLE(126,
95),N:NEXTN:RETURN
730 PCLEAR8:GOTO70
```

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Reviving A Nearly Lost Art With *Little Letter Writer*

By Steve Blyn
Rainbow Contributing Editor

Letter writing is an often overlooked skill, not only in conjunction with computers but also in education in general.Letter writing was once the universal way of communicating with others that you could not visit. Now letter writing is becoming a lost art. The invention of the telephone and the recent rise of the use of modems has fostered a decrease in letter writing in our country.

Letter writing remains an important skill to learn. Besides, it is fun. You can't yet easily call a baseball player or a famous author on your modem.

I always enjoy teaching units on letter writing. To make the teaching more enjoyable, I encourage the students to write practice letters to real personalities. Some ideas that we have used successfully are letters to famous people in the news, sports figures, show business personalities, authors of books that we have read and illustrators of children's books.

It may be obvious, but please try to make certain that the people that the children write to are still alive. We often have the pleasure of receiving answers to our letters. Famous personalities often respond or have a secretary write a response for them. Some illustrators have sent sketches back to the children.

There are many fine word processors on the CoCo market today. They may all be used to help create professional looking letters. I use two different ones in my classroom to acquaint the students with different styles of word processors. This month's article presents the *Little Letter Writer*.

The *Little Letter Writer's* value is that it teaches the correct format of a friendly letter. Business letters are a more advanced form of letter writing and should be taught after the friendly letter is fully mastered.

Friendly letters have a specific format to follow. The components are the Date, the Greeting or Salutation, the Body of the letter, and the Closing. Each part is taught to middle grade students and is reinforced by this program. The placement of the portions of the letter is correctly done by the program.

The Salutation has lately become the most amusing portion to teach. Not too many years ago, it was proper to addresss most unknown recipients of letters as "Dear Sir, . . ." Now, of course, there are so many women working that we often use "Dear Person, . . . " In the near future, perhaps computers will read our mail. It is fun for kids to speculate on what the future common salutations will be. Will it be "Dear Machine, . . . " or perhaps "Dear It, . . . " or perhaps "Dear RAM, . . . "

The program asks if you have a printer. If you answer yes, then Z will equal 1 and the letter will appear on the screen as well as on the printer. The program lines ending in the number five have information for the printer. You may omit these if you are not using a printer.

Several special factors were taken into consideration while developing this short program. On an input for the date, a comma will give an Extra Ignored message and then will ignore the year after the comma. To solve this, Line 70 will wipe out this message, and the comma and the year will automatically be inserted on Lines 130 and 135 in any case. Also, words may break up at the end of lines. This is unfortunate, but our aim was to show the parts of a friendly letter, rather than to create a word processor. The letter is also limited to about 250 characters. This should be sufficient for most early student purposes.

There is no need to indent for the body of the letter. The correct tabs and margins have been pre-set by the program. A random selection of closings is included to show the student some of the possibilities. As soon as the [ENTER] key is pressed at the end of the body, the letter will be printed in correct form on the screen and on the optional printer. After the letter is printed, you may press any key to begin again.

The *Little Letter Writer* can be used in several ways. Corrections can be made on the screen either before or after printing. Buddies may also correct each other's product. We hope your children or students use this program to write letters to real live people. The answers they receive are great Language Arts reinforcement. Perhaps they will even drop us a line at Computer Island. We will gladly respond.

(Steve Blyn teaches both exceptional and gifted children, holds two master's degrees and has won awards for the design of programs to aid the handicapped. He and his wife, Cheryl, own Computer Island.)

```
80 ...... 0178
160 ..... 02D5
END ... 040F
```

The listing:

```
5 REM"A LITTLE LETTER WRITER BY
STEVE BLYN,COMPUTER ISLAND,1983"
10 CLS
20 L$="LETTER WRITER"
30 FORT=1TO13:PRINT@8+T,MID$(L$,
T,1):NEXT
40 PRINT:LINE INPUT"ARE YOU USIN
G A PRINTER?";PR$
45 IF LEFT$(PR$,1)="Y" THEN Z=1
50 PRINT@9,"LETTER WRITER";
60 SOUND200,1:PRINT@64,"the date
":PRINT"WHAT IS TODAY'S DATE?":I
NPUTD$
70 PRINT@160," "
```

CC SOFTWARE

EXTENDED BASIC not Required unless noted. Programs require a 16K Computer and are Disk Compatible.

* UNIVERSAL PROGRAM 1(UP-1) *
A powerful utility that allows programs to be stacked in memory until the memory is filled. Jump from one program to another or compose new ones while retaining the old ones. Also included are tools for patching defective programs plus many other useful functions. Tape $14.95, Cart. $24.95

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```
80 SOUND200,1:PRINT@192,"the gre
eting or salutation":PRINT"TO WH
OM ARE YOU WRITING A LETTER";:IN
PUT W$
90 SOUND200,1:PRINT:PRINT"the cl
osing or ending":PRINT"WHAT IS Y
OUR NAME?":INPUT N$
100 SOUND200,1:PRINT:PRINT"the b
ody or story - PRESS ENTER AND B
EGIN YOUR MESSAGE";:INPUT EN$
110 CLS
120 INPUT B$
130 CLS:PRINTTAB(15)D$;",1984
135 IF Z=1 THEN PRINT#-2,TAB(40)
D$;",1984"
140 PRINT"DEAR ";W$;","
145 IF Z=1 THEN PRINT#-2,"DEAR "
;W$;","
150 B$="    "+B$
155 IF Z=1 THEN PRINT#-2,"      "
;
160 PRINT:FORT=1 TO LEN(B$):PRIN
TMID$(B$,T,1);:SOUND175,1:NEXT:P
RINT
165 IF Z=1THEN PRINT#-2," ":FOR
T=1TO LEN(B$):PRINT#-2,MID$(B$,T
,1);:NEXT T:PRINT#-2," "
170 R=RND(4)
180 IF R=1 THEN R$="YOURS TRULY,
"
190 IF R=2 THEN R$="LOVE,"
200 IF R=3 THEN R$="SINCERELY,"
210 IF R=4 THEN R$="FONDLY,"
220 PRINT" ":PRINTTAB(15)R$
225 IF Z=1 THEN PRINT#-2," ":PRI
NT#-2,TAB(40)R$
230 PRINTTAB(15)N$
235 IF Z=1 THEN PRINT#-2,TAB(40)
N$
240 AGAIN$=INKEY$
250 IF AGAIN$="" THEN 240 ELSE C
LS:GOTO50
```

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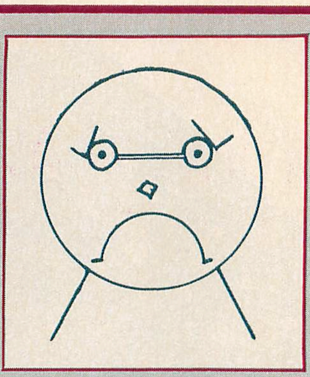
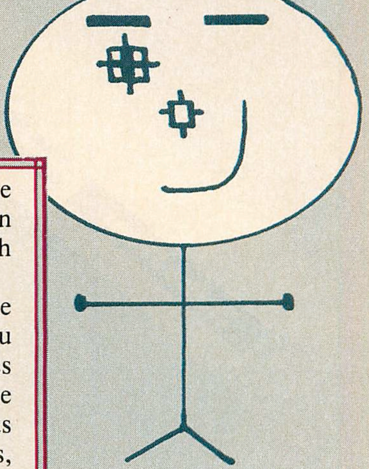
FACE To Face To Face To Face





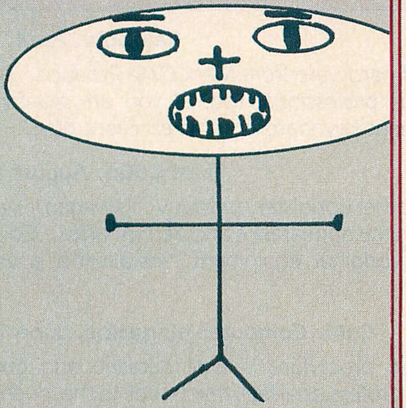
By John W. Kozubal

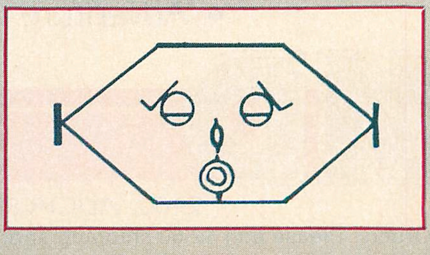
This program makes a lot of faces at you — some happy, some sad; some glad, some mad. One even whistles. The program requires a 16K CoCo with Extended BASIC. No speed-up function is used.

Have you ever seen those toys, or games, where you are supplied with several styles of noses, mouths, etc? Then you select those styles at random and place them on a featureless face to produce your own creation? (For instance, "Picture Your Face" in the October 1983 *Rainbow*.) It also selects different shaped heads at random. The selection of eyes, mouths, noses and eyebrows gives 2,200 faces. Couple those with several different heads and we get not 5,000, not 10,000, but 15,400 combinations. Couple this with the colors and we get 61,600 combinations. Each face is on the screen for about five seconds. With no repeats, it would take about 80 hours for each of the combinations to appear on the screen.

To get the show on the road, type, or load the program into the computer. Type *RUN* and press [ENTER]. Watch the screen for a while. See if you can spot the same face twice.

You may want to try some of your own features. To do this, observe the program. Take eyes, for example. The *RND* statement in Line 180 selects a number from 1 to 8. Let's see what happens when the computer selects 5. We tell the computer what to do if E is equal to 5. In Line 230 the computer is sent to Line 1080. Starting at Line 1080, two eliptical circles are drawn. The .45 represents a height width ratio which is wider than high. Kind of a vertical elipse. After the two eliptical circles are drawn, the computer is returned to the line following the one that sent it there; Line 240. Each feature is selected in a similar manner. Give it a try. You may create some interesting faces.





(John W. Kozubal, a disabled southern Californian, is a former president of a TV sales and service company and former electro hydraulic engineer for General Electric.)

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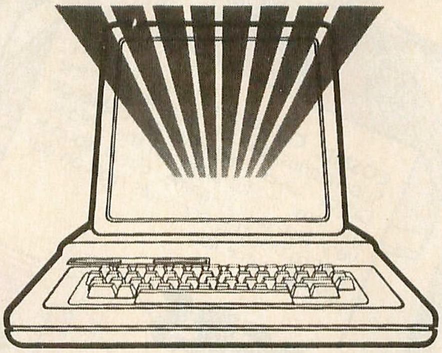
SUPER SCREEN

the Color Computer Supercharger



- **A big 51 character by 24 line screen.**
- **Full upper and lower case characters.**
- **Easily combine text with hi-res graphics.**
- **PRINT @ is completely functional on the big screen.**
- **The powerful ON ERROR GOTO is fully implemented.**
- **Auto-key repeat for greater keyboard convenience.**
- **Control codes for additional functions.**
- **Works with 16K, 32K or 64K computers.**
- **Available on disc or cassette.**

51 CHARACTER BY 24 LINE DISPLAY

Super Screen is a powerful, machine language program that significantly upgrades the performance and usefulness of 16K or greater, Extended and Disc Basic Color Computers. The standard Color Computer display screen is totally inadequate for serious, personal or business applications so Super Screen replaces it with a brand new, 51 character wide by 24 line screen including full upper and lower case characters. Instead of a confusing checkerboard appearance, you now have true lower case letters along with a screen that is capable of displaying 1224 characters. The difference is startling! Your computer takes on new dimensions and can easily handle lines of text that were simply too long and complex to display on the old screen.

COMBINE TEXT WITH HI-RES GRAPHICS

You can now write truly professional looking programs that combine text with hi-res graphics. Super Screen allows you to create graphics displays with the Basic LINE, DRAW and CIRCLE statements and then notate the graphics with descriptive text. You can even use PRINT @ if you wish for greater programming convenience. Super Screen's versatility will amaze you.

PRINT @ IS FULLY IMPLEMENTED

The PRINT @ statement is a valuable asset to the programmer when formatting text on the screen. The standard Color Computer will report an error if you specify a location higher than 511 but Super Screen allows locations all the way to 1223! You get a big screen and a powerful formatting tool as well. Of course, Super Screen also supports the CLS command allowing you to clear the big screen using standard Basic syntax.

ON ERROR GOTO

That's right! Super Screen gives you a full implementation of ON ERROR GOTO including the ERR and ERL functions. Now you can trap errors and take corrective action to prevent crashed programs and lost data using the same standard syntax as other computers. The ON ERROR GOTO capability overcomes a serious deficiency of Color Computer Basic and greatly improves your capability to handle sophisticated tasks. All well written, 'user friendly' programs use error trapping techniques and yours can too! Now that's power!

AUTO KEY REPEAT

No more frustration as you edit a long line in your Basic program; just hold the space bar down and automatically step to the desired position in the line. Need a line of asterisks? Hold the key down and auto repeat will give them to you. Those of you who spend many hours at your keyboard will appreciate this outstanding addition to Super Screen's long list of impressive capabilities.

CONTROL CODES FOR ADDITIONAL FUNCTIONS

Super Screen recognizes several special control code characters that allow selection of block or underline, solid or blinking cursor and other functions. You can 'Home up' the cursor or you may erase from the cursor to the end of a line or to the end of the screen just like many other computers. These special codes give you an extra dimension of versatility and convenience that put Super Screen in a class by itself.

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Super Screen comes with complete, well detailed instructions and is available on cassette or disc. It adjusts automatically to any 16K or greater, Extended or Disc Basic Color Computer or TDP-100 and uses only 2K of memory in addition to the screen memory reserved during power up. Guaranteed to be the most frequently used program in your software library. . .once you use it, you won't be without it! Super Screen's low price will really please you; only $29.95 on cassette or $32.95 on disc!

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COSMIC CLONES—Clonial Warriors, Superklones, Double Bombs and "the Death Layer" relentlessly challenge the most skillful player in this unique, very fast action game. Great sounds and colors. This one rates high on our favorite game list.

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BUMPERS—Tension mounts as you race through a randomly generated maze made even more challenging by walls that are invisible until you bump into them. This outstanding game allows two players to compete simultaneously or you may play alone against the computer.

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180	018F
590	0492
840	072B
1220	09C4
1540	0C5B
END	0E82

The listing:

```
10 CLS4
20 '
30 ' BY    JOHN W. KOZUBAL
           10353 COMPTON BLVD.
           BELLFLOWER, CA 90706
40 '
50 '
60 ' FOR USE ON 16K OR GREATER
70 ' MUST HAVE EXTEVDED BASIC
80 ' NO SPEED-UP FUNCTION USED
90 PRINT @ 236, "FACES";
100 PLAY "T255O3CGCGO5CG"
110 A=A+1:IF A=20 THEN 120 ELSE
100
120 PCLS:P=RND(4)
130 S=RND(2)-1
140 PMODE P,1
150 SCREEN 1,S
160 PCLS
170 FOR X=1 TO 30:NEXT:PLAY"O5T2
55CGCGCG
180 E=RND(8)
190 IF E=1 GOSUB 860
200 IF E=2 GOSUB 970
210 IF E=3 GOSUB 1000
220 IF E=4 GOSUB 1030
230 IF E=5 GOSUB 1080
240 IF E=6 GOSUB 1050
250 IF E=7 GOSUB 910
260 IF E=8 GOSUB 1110
270 H=RND(7)'           HEAD
280 IF H=1 GOSUB 610
290 IF H=2 GOSUB 670
300 IF H=3 GOSUB 740
310 IF H=4 GOSUB 720
320 IF H=5 GOSUB 770
330 IF H=6 GOSUB 790
340 IF H=7 GOSUB 830
350 M=RND(11)'            MOUTH
360 IF M=1 GOSUB 1440
370 IF M=2 GOSUB 1470
380 IF M=3 GOSUB 1490
390 IF M=4 GOSUB 1510
400 IF M=5 GOSUB 1560
410 IF M=6 GOSUB 1580
420 IF M=7 GOSUB 1680
430 IF M=8 GOSUB 1700
440 IF M=9 GOSUB 1730
450 IF M=10 GOSUB 1750
460 IF M=11 GOSUB 1780
470 N=RND(5)'          NOSE
480 IF N=1 GOSUB 1320
490 IF N=2 GOSUB 1350
500 IF N=3 GOSUB 1370
510 IF N=4 GOSUB 1390
520 IF N=5 GOSUB 1410
530 B=RND(5)'          BROW
540 IF B=1 GOSUB 1170
550 IF B=2 GOSUB 1200
560 IF B=3 GOSUB 1230
570 IF B=4 GOSUB 1260
580 IF B=5 GOSUB 1290
590 FOR X=1 TO 2000:NEXT X:GOTO
120
600 '**********HEAD********.****
610 CIRCLE(128,96),80 'CIRCLE
620 DRAW  "BM49,86;L5D15R5"
630 DRAW  "BM207,86;R5D15L5"
640 DRAW "BM168,165;F10"
650 DRAW "BM88,165;G10"
660 RETURN
670 CIRCLE(128,96),44.44,,1.8 '
   VERTICAL ELIPSE
680 DRAW "BM128,175;R30U5D5E5G5R
5L5F5H5L30D15U15L30U5D5H5F5L5R5G
5E5"
690 RETURN
700 DRAW"BM128,96;BL75E50R30F50
710 RETURN
720 DRAW"BM128,96;BL75E50R50F50G
50L50H50U10D20U10F50R50E50U10D20
730 RETURN
```

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```
740 CIRCLE(128,96),100,,.5 '
    HORIZ ELIPSE
750 DRAW "BM128,160;U15D15R30U2R
2D4L2U2L60U2L2D4R2U2R30D7D15F6H6
G6E6"
760 RETURN
770 DRAW"BM125,96;BL50U84R100D16
8L100U84"
780 RETURN
790 CIRCLE(128,96),200,,.3
800 '        HOR ELIPSE, WIDE
810 RETURN
820 '        VERT ELIPSE, HIGH
830 CIRCLE(128,96),40,,3.5
840 RETURN
850 '*********EYES*************
860 CIRCLE(100,96),3
870 CIRCLE(156,96),3
880 CIRCLE(156,96),8,,.3
890 CIRCLE(100,96),8,,.3
900 RETURN
910 CIRCLE(100,96),10
920 CIRCLE(156,96),10
930 DRAW"BM100,96;BR8;R38;U2;L38
D2"
940 CIRCLE(100,96),1
950 CIRCLE(156,96),1
960 RETURN
970 CIRCLE(100,96),3
980 CIRCLE(156,96),3
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```
990 RETURN
1000 DRAW "BM100,96;H4F8H4E4G8"
1010 CIRCLE(100,96),6
1020 RETURN
1030 CIRCLE(100,96),5,,.2
1040 RETURN
1050 CIRCLE(156,96),8,,1.5
1060 CIRCLE(100,96),8,,1.5
1070 RETURN
1080 CIRCLE(100,96),8,,.45
1090 CIRCLE(156,96),8,,.45
1100 RETURN
1110 CIRCLE(100,96),8
1120 CIRCLE(156,96),8
1130 DRAW"BM100,96;BD2;L3R7"
1140 DRAW"BM156,96;BD2;L3R7"
1150 RETURN
1160 '*********BROW*************
1170 DRAW "BM100,86;L3G1E1R3F3"
1180 DRAW "BM156,86;L3G3E3R3F1"
1190 RETURN
1200 DRAW "BM100,86;L5R8F10"
1210 DRAW "BM156,86;R5L8G10"
1220 RETURN
1230 DRAW "BM100,86;R10L20U1R20U
1L20U1R20"
1240 DRAW "BM156,86;L10R20U1L20U
1R20U1L20"
1250 RETURN
1260 DRAW "BM100,82;G13H2"
1270 DRAW "BM156,82;F13E2"
1280 RETURN
1290 CIRCLE(100,96),15,,2,.6,.91
1300 CIRCLE(156,109),13,,2,.6,.9
1
1310 RETURN
1320 '**********NOSE************
1330 DRAW "BM128,96;D10L3R6"
1340 RETURN
1350 DRAW "BM128,100;G10E10F10"
1360 RETURN
1370 CIRCLE(128,106),4,,2
1380 RETURN
1390 CIRCLE(128,106),2
1400 RETURN
1410 CIRCLE(128,106),15,,.2
1420 RETURN
1430 '********MOUTH*************
1440 DRAW "BM110,130;R46"
1450 DRAW "BM122,130;D6L3U6R2D6L
2U6R1D6"
1460 RETURN
1470 CIRCLE(128,136),30,,.25,.5
1480 RETURN
1490 CIRCLE(128,136),20,,1.2,.5
1500 RETURN
1510 CIRCLE(128,136),9
1520 CIRCLE(128,136),7
1530 SOUND 200,2:SOUND 190,2:SOU
ND 200,3
```

```
1540 PLAY "T100;CDEFG;O3;ABO4;CD
EFGABO5;CDEFG":SOUND 250,2:FOR Y
=1 TO 800:NEXT Y
1550 RETURN
1560 CIRCLE(128,136),30,,.1,.5
1570 RETURN
1580 CIRCLE(128,132),30,,.5
1590 ' HOR ELIPSE - FULL
1600 DRAW "BM128,126;BR20U4L1D4B
L5U6L1D6BL6U7L1D7BL7U8L1D8BL6U7L
1D7BL6U5L1D5BL6U3L1D3"
1610 DRAW "BM128,138;BR20D4L1U4B
L6D6L5U6BL7D8L1U8BL5D7L1U7BL6D7L
1U7BL7D5L1U5BL4D3L1U3"
1620 SOUND 1,1
1630 PLAY"T255;O5CDEFG"
1640 B=B+1
1650 IF B=14 THEN 1670
1660 GOTO 1620
1670 RETURN
1680 CIRCLE(128,115),30,,.8,.1,.
4
1690 RETURN
1700 CIRCLE(128,115),30,,.8,.95,
.4
1710 ' OFF CENTER SMILE
1720 RETURN
1730 DRAW "BM128,135;H20E2G4E2F3
0E2G4"
1740 RETURN
1750 CIRCLE(128,115),30, ,.7,0,.
5
1760 'ON CENTER SMILE
1770 RETURN
1780 CIRCLE(128,115),30,,.7,.1,.
55
1790 RETURN
```

Hint . . .

Upside-Down Loading

If you've been having problems with I/O Errors when loading programs from cassette, try reloading with the cassette recorder placed upside down. It may not be technically refined, and it may not work, but when faced with the dreaded I/O it's worth a try. Besides, Rick Bullon, who suggested this method, says it works for him 90 percent of the time.

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A Most Moving Message

By Oleg Boyarsky

How many times have you seen your program lose its "touch" just when someone had to simply read the instructions? Well, now you can think about the reaction on your friend's face when he sees all your messages "run" across the screen. That's right, the following program, even though it's very small, will move any message any place across the CoCo screen. While running it, you simply have to enter where the message is to appear (letter by letter), and where the message is to disappear (letter by letter). In case you have forgotten, all "PRINT @" locations are in the back of your CoCo manual. Think of the possibilities of moving your messages across the screen at an enormous speed. Best of all, this program fits any size Color Computer, and it can be easily adapted to your own programs. This program is made to be used by itself, but if you want to adapt this "message mover" to your programs, simply delete Lines 10-30, and upon entering the subroutine have S equal your finish PRINT @ position, P equal your start PRINT @ position and A$ equal your message. Also, change Line 70 to read: 70 IF B$=“”THEN RETURN ELSE40. If the message moves *too fast* for you, then enter the following lines into the program which will make the messages move faster or slower depending upon the ASCII number for that letter. (The ASCII numbers can be found at the end of the CoCo manual.) Okay, the lines are:

52 C$=INKEY$:IF C$ < > “” THEN C=ASC(C$)*5

54 FOR DE = 1 TO C: NEXT DE

Also, if you want the program to start over after each message is written, then change Line 70 to read: 70 IF B$=“” THEN5 ELSE40.

Now, here is the line by line explanation of the original program.

Line 5 Clears the screen and plenty of string space for the program's use.

Lines 10-20 Enter the start and stop information and check it at the same time to make sure that the values are within the boundaries of the screen, and that the start is not less than finish.

Line 30 Enters the message and puts it into the A$. This line also clears the screen.

Line 40 The main use of this line is to create the initial effect when the message appears on the screen letter by letter. Simply, this line states: If B$ is the same as A$ (original message "holder") then don't do anything; if not, then take one letter or character from A$ and put it in a corresponding place in B$.

Line 50 This line does just the opposite. It creates the disappearing effect. It simply states that: Reduce the printing position (P) by one only if it is not equal to the stop position (remember, it's the one you entered in the beginning). If it is equal, then take the first character of the B$ (computer's message holder) and erase it.

Line 60 This line prints the B$ and a space after it to create the disappearing effect.

Line 70 This line checks to see if everything is finished; if not, then go back to Line 40.

As you can see, the program is easy to change in order to fit into your own programs. Or, don't touch it at all, and simply use it as is. Anyway, the decision is yours, play around with it, I am sure that it will provide you hours of entertainment.

The listing:

```
5 CLS:CLEAR1000
10 INPUT"PLEASE INPUT THE FINISH
 POS.";S:IF S<0 OR S>511 THEN 10
20 INPUT"PLEASE ENTER THE START
POS";P:IF P<0 OR P>510 OR P<S TH
EN 20
30 PRINT:LINE INPUT"PLEASE ENTER
 THE MESSAGE          ";A$:CLS:IF
A$=""THEN 30
40 IF D<>LEN(A$) THEN D=D+1:B$=B
$+MID$(A$,D,1)
50 IF P=S THEN B$=RIGHT$(B$,LEN(
B$)-1)ELSE P=P-1
60 PRINT@P,B$" ";
70 IF B$=""THEN END ELSE40
```

(Oleg Boyarsky is currently a junior in high school. His main hobbies include electronics and computer programming. He and his brother have built a tremendous library of hardware and software for the Color Computer.)

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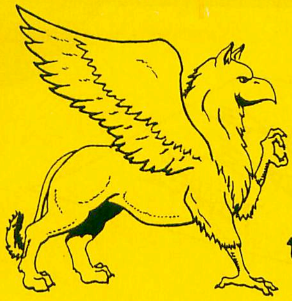
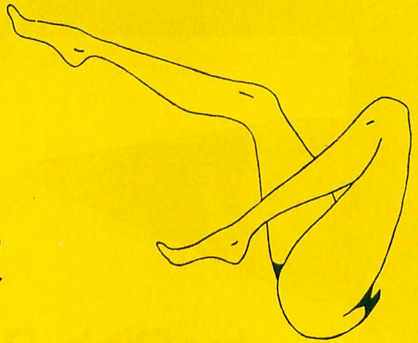


Guess the Animal



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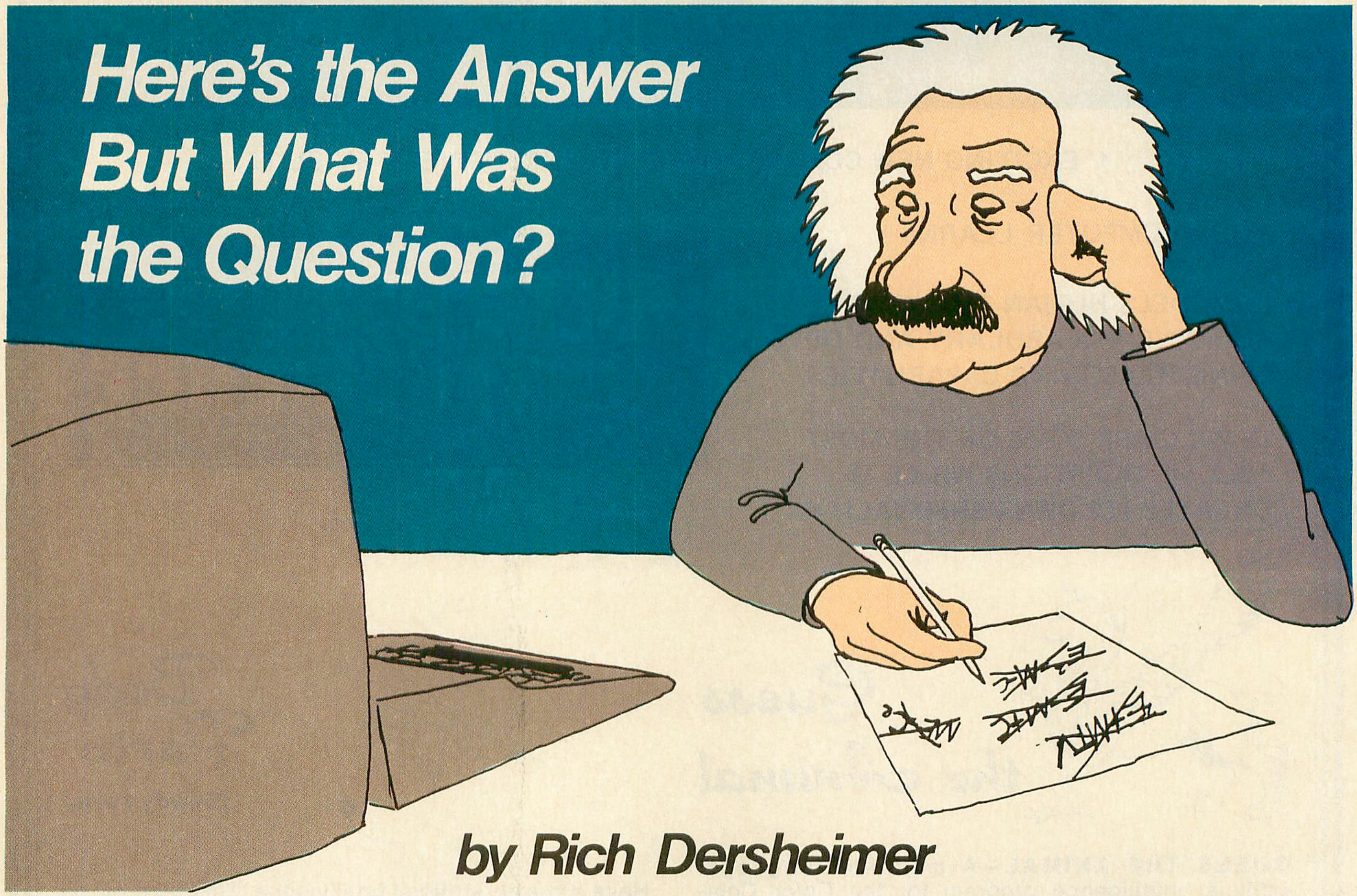

by Rich Dersheimer

I've noticed that lately there has been a lot of educational software for sale, and it seems that there are lot of programs for teaching kids the basics of math. It also seems that most of these math programs ask the student to give the answer to an equation or math problem. So, I thought it would be neat to write a program that gives the answer and asks for the equation.

This turned out to be a tougher problem than I expected. I tried using the BASIC *VAL* statement, but it won't accept the operators (+-*/) as part of the variable. For a while I thought about digging into the ROM to find out how the CoCo interprets equations, but I don't know enough about assembly language for that. Then I remembered a letter to the editor that appeared in the June 1981 issue of *the Rainbow*. A Mr. Poster of New Jersey had come up with a method for changing program lines while the program was running. If I could start with some kind of dummy equation, and then change it to match the player's input, I could let BASIC figure the equation.

Since Coco doesn't compile the program, instead interpreting each line as it comes to it, this technique works just fine.

The Program
Lines 30—70: This disables the break and [SHIFT][@] keys while the program is waiting for the equation input. (This routine was written by Charles Roslund and appeared in *Color Computer News,* Issue No. 6, February 1982)
Line 80: Reseeds the random number generator.
Line 110: Holds the equations.
Line 120: Rounds off the answer to three places.
Lines 140—170: Set up the game screen.
Lines 180—210: Use the BASIC beginning of program pointer and *PEEKS* to find line 110.
Lines 260—380: Build the computer's equation. At various levels of play the equation will include addition, subtraction, multiplication and division.
Lines 410—540: More screen set up. Outputs the numbers and symbols used to form the equation.
Lines 550—680: Get the input from the player. Checks for help wanted, quit the game, start the equation over, and check the equation.
Line 690: Checks to see if all symbols have been used.
Lines 690—750: Build the player's equation.
Line 760: Incorrect routine. A tone is sounded and the computer's equation is shown.
Lines 770—790: Correct equation. A tune is played and the computer's equation is shown. If the player gets three correct in a row, the level of difficulty is raised.
Lines 800—870: Run out of time routine. A tone is sounded.
Lines 840—870: Display of computer's equation.
Lines 900—920: Raise the difficulty one level.
Lines 970—1160: Subroutine to solve the equation. The equation is *POKED* into Line 110, using ASCII values for numbers, and BASIC tokens for the operators. Then Line 110

(Rich Dersheimer is the graphics director at KVII-TV in Amarillo, Texas. He taught several classes for children this summer, using 10 TRS-80 CoCos at the Don Harrington Discovery Center in Amarillo.)

is referenced to obtain the solution.
Lines 1170—1340: Displays the title page.
Lines 1350—1510: Instructions. If no response is given on any instruction page, the program returns to the title page. That way if you go off and leave the program running, it doesn't just sit there.
Lines 1530—1600: Pick level. This returns to the title page if no response is given.
Lines 1620—1990: Data for title page. Hex codes for the graphic blocks that make up the title.
Line 2000: A reverse reference that *PCLEARS* one page of graphics.

The program should be simple and easy to operate. If it should happen to bomb out, check to see that Line 110 is still as follows:

110 A=***************

Mathgame will run on a 16 or 32K system, with or without disk. I have included several features in the program that I feel are useful in an educational program for young people.

The [BREAK] key and the [SHIFT] [@] keys are both disabled. When looking at the instructions or picking a starting level, if the program is left unattended, it will cycle back through the title page, which will hopefully draw attention of anyone nearby. When a correct equation is entered, the player is rewarded with a simple tune. If the equations get harder, another tune is heard. When an incorrect equation is entered, a short tone is heard. This makes it more interesting to win than lose. The timer is displayed on the screen and by a short bleep, which adds lots of pressure to think quick.

Before letting a young person run this program, try it yourself, but start at an easy level. Unless you're a math genius, the harder levels are just too frustrating!

160	01D6	1250	0CE2
420	0492	1400	0FC4
560	067E	1560	14A0
840	09B5	END	192C

The Listing:

```
10 CLS0
20 GOTO 2000
30 IF PEEK(&H3EB9)<> &H32 THEN C
LEAR 700,&H3EB0:FOR I=&H82B9 TO
&H831E:POKE I-&H4400,PEEK(I):NEX
T ELSE CLEAR 700:GOTO 70
40 FOR I=0 TO 2:POKE &H3EBD+I,18
:NEXT:I=&H3F1E
50 POKE I,&H26:POKE I+1,3:POKE I
+2,&H7E:POKE I+3,&H83:POKE I+4,&
H22:POKE I+5,&H7E
60 POKE I+6,&HA4:POKE I+7,&H4C
70 POKE &H19B,&H3E
80 R=RND(-TIMER)
90 DIM EA(14)
100 GOTO 1170
110 A=***************
120 A=INT(A*1000+.5)/1000
130 GOTO 1120
140 CLS3:FOR X=33 TO 449 STEP 32
:PRINT@X,STRING$(30," ");:NEXT X
:PRINT@66,"THE NUMBER IS";
150 PRINT@418,STRING$(26,191);
160 PRINT@290,STRING$(26,191);
170 FOR X=322 TO 386 STEP 32:PRI
NT@X,CHR$(191);:PRINT@X+25,CHR$(
191);:NEXT X
180 ST=PEEK(25)*256+PEEK(26)
190 IF PEEK(ST)=173 THEN 220
200 ST=ST+1
210 GOTO 190
220 FOR X=1 TO 14
230 EA(X)=0
240 NEXT X
250 E$=""
260 FOR X=1 TO N
270 R=RND(9):E$=E$+MID$(STR$(R),
2,1)
280 EA(R)=EA(R)+1
290 IF X=N THEN 330
300 IF EA(12)=0 AND (L5=4 OR L5=
6) AND RND(3)=1 THEN E$=E$+"*":E
A(12)=EA(12)+1:GOTO 330
310 IF EA(13)=0 AND (L5=5 OR L5=
6) AND RND(3)=1 THEN E$=E$+"/":E
A(13)=EA(13)+1:GOTO 330
320 IF RND(2)=1 THEN E$=E$+"+":E
A(10)=EA(10)+1 ELSE E$=E$+"-":EA
(11)=EA(11)+1
330 NEXT X
340 IF EA(10)=0 OR EA(11)=0 THEN
 220
350 IF L5=4 AND EA(12)=0 THEN 22
0
360 IF L5=5 AND EA(13)=0 THEN 22
0
370 IF L5=6 AND (EA(12)=0 OR EA(
13)=0) THEN 220
380 CE$=E$:A$=E$:L=LEN(E$)
390 GOSUB 970
400 E=A:A$=""
410 PRINT@80,"          ";
420 PRINT@80,E;
430 FOR X=27 TO 4 STEP -1
440 SET(58,X,5):SET(59,X,5)
450 NEXT X
460 T=4
470 TIMER=0
480 A$="":PRINT@200,STRING$(LEN(
E$),".");"        ";:P=200
490 PRINT@323,"";:FOR X=1 TO 9:I
F EA(X)=0 THEN NEXT X ELSE FOR Y
=1 TO EA(X):PRINT X;:NEXT Y:NEXT
 X
500 PRINT@355,"";:IF EA(10)=0 TH
EN 510 ELSE FOR X=1 TO EA(10):PR
INT" + ";:NEXT X
510 IF EA(11)=0 THEN 520 ELSE FO
R X=1 TO EA(11):PRINT" - ";:NEXT
 X
520 IF EA(12)=0 THEN 530 ELSE FO
R X=1 TO EA(12):PRINT" * ";:NEXT
 X
530 IF EA(13)=0 THEN 540 ELSE FO
```

```
R X=1 TO EA(13):PRINT" / ";:NEXT
 X
540 PRINT@390,"USE THESE SYMBOLS
";
550 I$=INKEY$
560 IF TIMER>N*25 THEN RESET(58,
T):RESET(59,T):TIMER=0:T=T+1:SOU
ND 200,1
570 IF T=28 THEN 800
580 IF I$="" THEN 550
590 IF I$="Q" THEN CLS:END
600 IF I$="H" THEN 1380
610 IF I$=CHR$(13) THEN 690
620 IF I$=CHR$(12) THEN 480
630 IF I$=" " THEN 550
640 FOR W=1348 TO 1369 STEP 3:IF
 PEEK(W)=ASC(I$)+64 THEN POKE W,
96:PRINT@P,I$;:P=P+1:GOTO 550
650 NEXT W
660 FOR W=1380 TO 1398 STEP 3:IF
 PEEK(W)=ASC(I$)+64 THEN POKE W,
96:PRINT@P,I$;:P=P+1:GOTO 550
670 NEXT W
680 GOTO 550
690 FOR X=200 TO 200+LEN(E$)-1:I
F PEEK(1024+X)=110 THEN PRINT@45
1,"YOU MUST USE ALL SYMBOLS";:SO
UND 1,20:PRINT@451,"
                ";:GOTO 480
```

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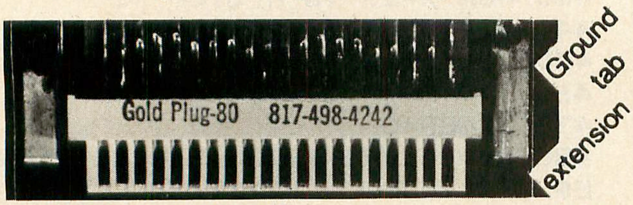

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```
700 A$=A$+CHR$(PEEK(1024+X)-64)
710 NEXT X
720 L=LEN(A$)
730 GOSUB 970
740 S=A
750 PRINT@P," =";S;
760 IF E<>S THEN NW=0:PRINT@164,
"INCORRECT EQUATION!";:SOUND 1,1
5:GOTO 810
770 NW=NW+1:IF NW=3 THEN N=N+1:N
W=0:WF=1
780 IF N>8 THEN N=8
790 PRINT@164,"YOU GOT IT RIGHT!
";:PLAY"T2O2L4ABGO1L4GO2L2D":GOT
O 810
800 PRINT@164,"YOU RAN OUT OF TI
ME!";:SOUND 1,15
810 FOR X=323 TO 387 STEP 32
820 PRINT@X,STRING$(24," ");
830 NEXT X
840 PRINT@324,"COMPUTER'S EQUATI
ON IS";
850 PRINT@362,CE$;
860 FOR X=1 TO 2500:NEXT X
870 PRINT@164,"
   ";
880 FORX=323 TO 387 STEP 32:PRIN
T@X,STRING$(24," ");:NEXT X
890 IF WF=0 OR N=8 THEN 960
900 PRINT@324,"LET'S MAKE THE GA
ME";
910 PRINT@356,"A LITTLE HARDER,
OK?";
920 PLAY"T4O1L8FFFL1DP2L8EEEL1C#
P1"
930 PRINT@324,"
       ";
940 PRINT@356,"
   ";
950 WF=0
960 GOTO 180
970 FOR X=1 TO L
980 A=ASC(MID$(A$,X,1))
990 IF A<58 AND A>47 THEN POKE S
T,A
1000 IF A=43 THEN POKE ST,171
1010 IF A=45 THEN POKE ST,172
1020 IF A=42 THEN POKE ST,173
1030 IF A=47 THEN POKE ST,174
1040 ST=ST+1
1050 NEXT X
1060 IF L=15 THEN 1110
1070 FOR X=1 TO 15-L
1080 POKE ST,32
1090 ST=ST+1
1100 NEXT X
1110 GOTO 110
1120 ST=ST-15
1130 FOR X=0 TO 14
1140 POKE ST+X,173
```

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```
1150 NEXT X
1160 RETURN
1170 FOR X=1 TO 19:READ D$
1180 FOR Y=1 TO 19 STEP 2
1190 A=VAL("&H"+MID$(D$,Y,2))
1200 A1$=A1$+CHR$(A-16)
1210 NEXT Y,X
1220 FOR X=1 TO 19:READ D$
1230 FOR Y=1 TO 19 STEP 2
1240 A=VAL("&H"+MID$(D$,Y,2))
1250 B1$=B1$+CHR$(A-16)
1260 NEXT Y,X
1270 CLS7
1280 PLAY"O3T2L8CDEFGDEFECP4"
1290 PRINT@33,A1$;:PLAY"T255CDEF
GABBBT4P4P4":PRINT@257,B1$;:PLAY
"T255CDEFGABBBT4P4P4":L=486
1300 R$=" BY RICH DERSHEIMER "
1310 FOR X=1 TO LEN(R$):N=ASC(MI
D$(R$,X,1))
1320 IF N>64 AND N<91 THEN N=N-6
4
1330 POKE 1509+X,N:PLAY"T255O1CC
C"
1340 NEXT X
1350 FOR X=1 TO 2000:NEXT X:CLS:
PRINT:PRINT" DO YOU WANT INSTRUC
TIONS?":PRINT:PRINT"    PRESS Y O
R N":TIMER=0
1360 Q$=INKEY$:IF TIMER>1200 THE
N 1270
1370 IF Q$="" THEN 1360 ELSE IF
Q$="N" THEN 1530 ELSE IF Q$<>"Y"
 THEN 1360
1380 CLS:PRINT:PRINTTAB(12);"M A
 T H":PRINTTAB(12);"G A M E":PRI
NT:PRINT"    IN 'MATHGAME' THE C
OMPUTER  WILL PICK A NUMBER, AN
D IT IS  YOUR JOB TO BUILD AN E
QUATION  TO MATCH THAT NUMBER."
1390 PRINT:PRINT" IF THE  COMPUT
ER  PICKED 4 AS  IT'S NUMBER, T
HEN 1+1+2 WOULD  BE A LEGAL EQU
ATION.":PRINT@452,"(PRESS 'C' TO
 CONTINUE)":TIMER=0
1400 Q$=INKEY$:IF TIMER>2400 THE
N 1270
1410 IF Q$<>"C" THEN 1400
1420 CLS:PRINT:PRINT" BUT  YOU W
ON'T BE ABLE TO USE  JUST  ANY
NUMBERS OR SYMBOLS.  THE COMPUT
ER  WILL PICK WHICH  NUMBERS AN
D SYMBOLS  YOU WILL  BE ABLE  T
O USE.  EACH NUMBER  AND OPERAT
OR  (+ - * /)  THAT  YOU MAY  U
SE WILL BE INSIDE A"
1430 PRINT" RED BOX. EACH ONE CA
N BE USED  ONLY ONCE. TO USE A
NUMBER OR  SYMBOL, PRESS IT'S K
EY ON THE  KEYBOARD, AND IT WIL
L GO FROM  THE RED BOX TO THE E
QUATION."
1440 PRINT@452,"(PRESS 'C' TO CO
NTINUE)":TIMER=0
1450 Q$=INKEY$:IF TIMER>2400 THE
N 1270
1460 IF Q$<>"C" THEN 1450
1470 CLS:PRINT:PRINT" IF YOU WAN
T TO START  OVER ON  THE EQUATI
ON, PRESS THE clear  KEY. IF YO
U ARE DONE WITH THE  EQUATION,
PRESS THE enter KEY  TO SEE IF
YOU GOT IT CORRECT.  YOU WILL B
E PLAYING  MATHGAME  AGAINST TH
E CLOCK,  AND  WITH"
1480 PRINT" PROBLEMS  THAT  GET
HARDER AS  THE  GAME  GOES  ON.
  YOU MAY  PRESS THE 'H' KEY FO
R HELP OR  THE 'Q' KEY TO QUIT.
"
1490 PRINT@452,"(PRESS 'C' TO CO
NTINUE)":TIMER=0
1500 Q$=INKEY$:IF TIMER>2400 THE
N 1270
1510 IF Q$<>"C" THEN 1500
1520 NW=0
1530 CLS:PRINT:PRINT"  PICK YOUR
 STARTING LEVEL":PRINT:PRINT"
 ADDITION/SUBTRACTION":PRINT" 1)
```

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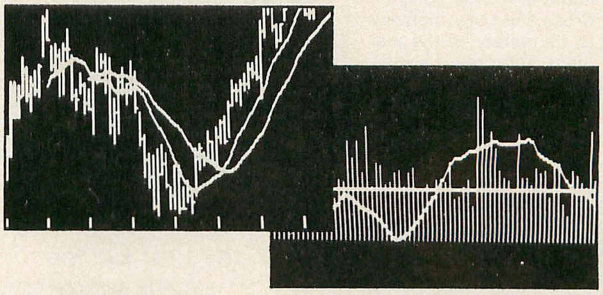
```
 EASY":PRINT" 2) MEDIUM":PRINT"
3) GETTING HARDER":PRINT
1540 PRINT"    MULTIPLICATION/DI
VISION":PRINT" 4) NOT SO BAD":PR
INT" 5) THESE ARE TOUGH":PRINT"
6) FORGET IT!"
1550 PRINT@452,"(PRESS 1-6 FOR L
EVEL)":TIMER=0
1560 Q$=INKEY$:IF TIMER>2900 THE
N 1270
1570 IF Q$="" THEN 1560
1580 IF Q$<"1" OR Q$>"6" THEN 15
60
1590 N=VAL(Q$):L5=N
1600 IF N<4 THEN N=N*2+1 ELSE IF
 N<6 THEN N=4 ELSE N=5
1610 CLS3:GOTO 140
1620 DATA AFF5FFFFFFAFF5FFFFFF
1630 DATA AFAFF5FFFFFFACACACAF
1640 DATA ACACF5FFAFF5FFFFAFF5
1650 DATA FFFFAFAFF5FFAFAFF5FF
1660 DATA FFAFF1F3AFF5FFFFFFFF
1670 DATA FFAFF5FFFFFFAFF5FFFF
1680 DATA AFF5FFFFAFF1AFAFF1AF
1690 DATA F5FFAFF1F7FFF3AFF5FF
1700 DATA FFFFFFAFF5FFFFFFAFF5
1710 DATA FFFFAFF5FFFFAFF5F3F3
1720 DATA F7AFF5FFAFACACACACAF
1730 DATA F5FFFFFFFFAFF5FFFFFF
1740 DATA AFACACACAFF5FFFFAFF5
1750 DATA FFFFFFAFF5FFAFF5FFFF
1760 DATA FFAFF5FFFFFFFFAFF5FF
1770 DATA FFFFAFF5FFFFAFF5FFFF
1780 DATA ACF5FFFFFFACF5FFACF5
1790 DATA FFFFFFACF5FFFFFFFFAC
1800 DATA F5FFFFFFACF5FFFFACF5
1810 DATA AFACACACACACF5FFFFFF
1820 DATA AFAFF5FFFFFFAFF5FFFF
1830 DATA FFAFF5FFAFACACACACF5
1840 DATA FFFFAFF5FFFFFFFFFFFF
1850 DATA FFAFF1F3AFF5FFFFAFAF
1860 DATA F5FFAFAFF5FFAFF5FFFF
1870 DATA FFFFFFFFAFF5FFFFFFFF
1880 DATA FFFFAFF1F7FFF3AFF5FF
1890 DATA AFF1AFAFF1AFF5FFAFAC
1900 DATA ACACF5FFFFFFAFF5FFAC
1910 DATA ACAFF5FFAFACACACACAF
1920 DATA F5FFAFF5F3F3F7AFF5FF
1930 DATA AFF5FFFFFFFFFFFFAFF5
1940 DATA FFFFFFAFF5FFAFF5FFFF
1950 DATA FFAFF5FFAFF5FFFFFFAF
1960 DATA F5FFAFF5FFFFFFFFFFFF
1970 DATA ACACACACACACF5FFACF5
1980 DATA FFFFFFACF5FFACF5FFFF
1990 DATA FFACF5FFACACACACACF5
2000 PMODE0:PCLEAR1:GOTO 30
```



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CU*BER

32K Mach. Lang.
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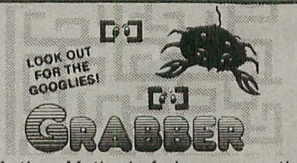
Approaches the excitement and challenges of any Video Arcade. The hazards of CU*BER are many. Help CU*BER change the colors on the pyramid while avoiding many of the dangers always present. Vipers, the *Nurd*, the Dork, bonus points all add up to another exciting release from Tom Mix Software.


LOOK OUT FOR THE GOOGLIES!
GRABBER

Arcade Action. Method of play you are the Grabber. The object is to grab the 8 treasures and store them in the center boxes. You start with 3 Grabbers and get extra ones at 20,000 points. Watch out for the googlies! Super high resolution graphics.

32K Machine Language
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AIR TRAFFIC CONTROLLER

AIR TRAFFIC CONTROLLER

32K Ext. Basic
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Air Traffic Controller is a computer model of an air traffic control situation in which Remotely Piloted Vehicles (RPV's) are operated by the controller in landing on and taking off from designated runways.

DEVIL ASSAULT

DEVIL ASSAULT

16K Machine Language
$27.95 TAPE
$30.95 DISK

Devil Assault is a multi-level multi-screen game in which bird-like creatures, robots and the devil himself assault your home base which you must defend.

BUZZARD BAIT

By RUGBY CIRCLE

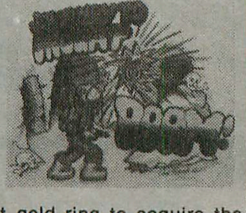
32K Machine Language
$27.95 Tape $30.95 Disk

BUZZARD BAIT

We've done it again! You thought the King was great? wait 'till you see this!! Outstanding high resolution graphics, tremendous sound make this "Joust" type game a must for your software collection. As you fly from cloud to cloud you will enjoy sky high excitement dealing with the challenges presented to you by this newest release by Tom Mix Software.

JOURNEY TO MT. DOOM

32K Mach. Lang.
$27.95 DISK ONLY



The Necromancer is about to wage war on earth. He needs his lost gold ring to acquire the power to do so. You must find the ring, take it to Mt. Doom and destroy it in the flames from which it came, thus eliminating the Necromancer's evil powers.

"THE FROG"

*****ARCADE ACTION*****

This one will give you hours of exciting play... Cross the busy highway to the safety of the median and rest awhile before you set out across the swollen river teaming with hidden hazards. Outstanding sound and graphics.

16K MACHINE LANGUAGE
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Climb vines, avoid obstacles & creatures to save your father from Luigi.

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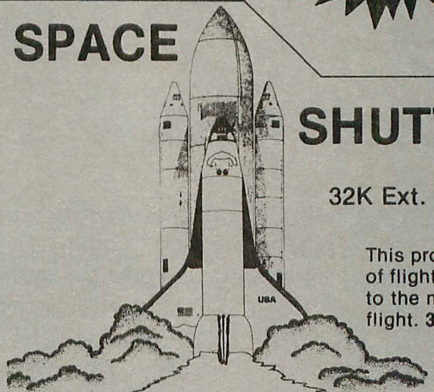

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This program gives you the real feeling of flight. Full instrumentation complete to the max. Actual simulation of space flight. **32K Extended Basic**

16K MACHINE LANGUAGE
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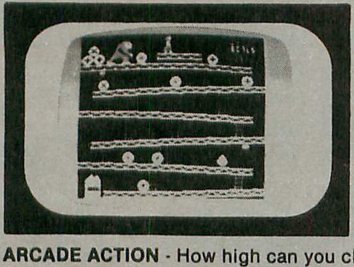
"TRAPFALL"

By KEN KALISH

*****ARCADE ACTION*****

The "Pitfalls" in this game are many. Hidden treasures, jump over the pits, swing on the vine, watch out for alligators, beware of the scorpion. Another game for the Color Computer with the same high resolution graphics as "The King."



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COLOR MONITOR-Written in position independent code. (May be located in any free memory). Very compact. Only occupies 1174 bytes of memory. Full Featured. Includes Break-Pointing of machine language programs, register display and modify, memory display and modify, and block memory move commands. Displays memory in hex and ascii format on one line 8 bytes long. **MACHINE LANGUAGE $24.95**

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STORY PROBLEMS is a program that is designed to give practice in solving STORY PROBLEMS (sometimes called STATEMENT, THOUGHT or WORD PROBLEMS) on the COLOR COMPUTER. It is suitable for use in either a home or school environment. It is also a tool that will allow you to create new story problems to suit your children's needs and ability levels. It has many features that make it particularly attractive: Story problems involving addition, subtraction, multiplication, division or a combination of the four are presented to the student by slowly scrolling each letter of each problem onto the screen. Up to 5 students may use the program at the same time. There are 4, user modifiabale, skill levels. 16K Ext. Basic **TAPE $19.95**

SPELLING TEST is designed to give a standard oral spelling test using the audio track of the computer's tape recorder to dictate test words and sample sentences. Student responses are typed on the keyboard and checked by the computer. Results are displayed on the screen and (if connected) on a printer. **REQUIRES 16K EXT. BASIC $19.95**

MATH DRILL is a program designed to help children to practice addition, subtraction, multiplication, and division skills on the COLOR COMPUTER. It has several features that make its use particularly attractive.

- Up to 6 students may use the program at the same time.
- Answers for addition, subtraction and multiplication are entered from right to left, just as they are written on paper.
- Commas may be included in the answers.
- Partial products for the multiplication problems may be computed on the screen.
- Division answers that have a remainder are entered as a whole number followed by the letter "R" and the remainder.
- There are ten, user modifiable, skill levels.
- A "SMILEY FACE" is used for motivation and reward. Its size increases relative to the skill level.
- Skill levels automatically adjust to the student's ability.
- A timer measures the time used to answer each problem and the total time used for a series of problems.
- After a problem has been answered incorrectly the correct answer appears under (above in division) the incorrect answer.

REQUIRES 16K EXT BASIC $19.95

WORD DRILL is designed to give a multiple choice vocabulary quiz. Words and definitions are entered into the program from the keyboard or from a tape file. The computer displays a randomly chosen definition and eight word choices. The student must enter his response before a built in timer reaches zero. **REQUIRES 16K EXT. BASIC $19.95**

EDUCATIONAL PACKAGE — SPELLING TEST — WORD DRILL — MATH DRILL — ESTIMATE — ALL FOR — $69.95

ESTIMATE is a program designed to help children to practice estimating the answers to addition, subtraction, multiplication and division problems on the COLOR COMPUTER. It has many features that make its use particularly attractive:

- Up to 5 students may use the program at the same time.
- There are 5, user modifiable, skill levels.
- The acceptable percent error may be changed as a student's skill improves.
- A timer measures the number of seconds used to answer each problem and the total time used for a series of problems.
- If a problem has been answered incorrectly, the student is told the percent error and asked to try again.
- If a problem is answered incorrectly a second time, the student is told the correct answer and the range of acceptable answers is displayed.
- A report is given at the end of each set of problems that includes the number of problems done, the number of problems answered correctly on the first try and the average percent error.
- The (BREAK) key has been disabled so that a child will not inadvertently stop the program from running.

16K EXT. BASIC $19.95

TEACHERS' DATABASE is a program designed to allow a teacher to keep a computerized file of information about his/her students. There are many features that make this program particularly attractive.

- Information on as many as 100 students (or more) may be in the computer at one time.
- Each student may have as many as 20 (or more) individual items of data in his/her record.
- The program will run from cassette or disk.
- Cassette and disk files are completely compatable.
- The program is menu driven.
- Records may be easily changed, deleted, combined or added.
- Information about students may be numerical or text.
- Records may be quickly alphabetized.
- Records may be sorted by various criteria.
- Records may be reordered (ranked) based on test scores or other data.
- Data displayed during a sort may be printed on a printer or saved on disk or cassette as a new file.
- A full statistical analysis of data may be done and sent to the printer.
- Student test scores may be weighted. **32K EXT BASIC TAPE $39.95**

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TYPING AID

16K
ECB

Let COCO TYPE Help You Tighten Up That Typing

By Leonard Hyre

How many CoCo owners shudder with terror at the thought of attempting to enter a long 16K program one hunt and peck stroke at a time. Well, have no fear, *CoCoType* is here!

I wrote *CoCoType* primarily for my kids. It seemed the most frightening thing about a computer was not the programming, but rather the strange looking collection of numbers and letters. It didn't take long to find out I was more than a bit rusty myself. Soon we were sharing *CoCoType* with other families. They all seemed to be pleased with it, so I want to share it with all of you.

When you run *CoCoType* you are first treated to opening credits (after all I do have an ego to stroke) and then move on to a menu. The menu offers you a choice of 1) Beginner, 2) Secondary or 3) Advanced. If 1 is chosen, the would-be typist is given a set of practice exercises, one at a time. Typing the exercise correctly four times gets you an appropriate musical reward and a new exercise. The Secondary option is similar, except that we leave the home keys and get on with those tough ones. These are important, especially for computer lovers, since we use all those symbols and numbers. For the Advanced option, the typist is presented with full-line phrases. For typing 24 perfect phrases, the student is graduated with honors and given appropriate respect.

Structure wise, I have kept *CoCoType* simple. I make liberal use of Extended BASIC's *PLAY* command to provide lots of whistles, along with musical interludes. The opening credits are controlled in Lines 1-5 and subroutine 6000. On return, we set a series of instructions and a menu. *INKEY$* selection at Line 21 and 22 send us to the various options. Lines 1000-1016 set up option 1 and then send the program to subroutine 4000 which is shared by option 2. If option 2 is selected, Lines 2000-2014 take over. The routine for option 3 is independent of the others and is set up and run within Lines 3000-3047. Lines 3055-3067 provide the "graduate" with an appropriate reward for his hard work.

By the way, if you are the one needing the typing lessons and thus are intimidated by the length of this program, I'll be happy to send you a copy on tape for $6. Just send your request to me at: Leonard Hyre, P.O. Box 403, Cambridge, MD., 21613.

If you like *CoCoType,* drop me a line. I promise my head won't swell beyond recognition. If you aren't thrilled and have an improvement in mind, I can also take mild criticism if it is done gently. Thanks for your interest. Have fun! Now, where is that 32K Adventure program I want to type in?

(Leonard Hyre, a claims representative for the Social Security Administration, has two CoCo programs on commercial market Harness Handicapper *and* Thoroughbred Handicapper *with Federal Hill Software. He also has had a game published.)*

13	02A2
1002	04A7
2008	07FD
3008	0B81
3036	0E44
3080	10B3
END	12BC

The listing:

```
1 CLS:DIMA$(18),B$(26):PRINTSTRI
NG$(32,168);
2 PRINTSTRING$(10,168)+" COCOTYP
ING "+STRING$(10,168);:PRINTSTRI
NG$(32,168);
3 PRINTSTRING$(8,207)+"by"+STRIN
G$(2,128)+"leonard"+CHR$(128)+"h
yre"+STRING$(8,207);:PRINTSTRING
$(32,207):PRINTSTRING$(32,175)
4 GOSUB6000:PRINT@448,"***PRESS
ANY KEY TO  CONTINUE***";
5 PLAY"T150O5V31GGGGG"
```

```
6 I$=INKEY$:IFI$=""THEN6
7 PLAY"T15005V31GGGGG"
10 CLS:PRINTSTRING$(32,159);:PRI
NT"THIS PROGRAM IS DESIGNED TO G
IVEYOU A NUMBER OF BASIC TYPING
   EXERCISES TO GET YOU STARTED
ON THE WAY TO BECOMING A CAPABLE
  TYPIST.";
11 PRINT:PRINT"THE SECRET IS TO
KEEP YOUR EYES ON THE SCREEN--NO
T ON THE KEYS. KEEP YOUR FINGERS
 ON THE 'HOME  KEYS'.THESE ARE--
-ASDF(LEFT) &  JKL;(RIGHT);"
13 PRINTSTRING$(32,159);:PRINT"*
****PRESS ANY KEY TO START*****"
;:PRINTSTRING$(32,159);
14 I$=INKEY$:IFI$=""THEN14
15 CLS:PLAY"T200V3105FGGF"
16 PRINTSTRING$(32,175):PRINT:PR
INT:PRINTSTRING$(32,207);:PRINT"
**L E V E L  S E L E C T I O N**
";:PRINTSTRING$(32,207):
17 PRINTTAB(10) "1> BEGINNER"
18 PRINTTAB(10) "2> SECONDARY"
19 PRINTTAB(10) "3> ADVANCED"
20 PRINTTAB(10) "<CHOOSE 1-3>"
21 I$=INKEY$:IF I$=""THEN 21
22 IF I$="1"THEN1000ELSEIFI$="2"
THEN2000ELSEIFI$="3"THEN3000ELSE
21
23 END
1000 CLS:PRINT"BELOW ARE SEVERAL
 EXERCISES TO GET YOU FAMILIAR
WITH THE MOST  COMMONLY USED KEY
S."
1002 PRINT"YOU WILL BE GIVEN THE
M 1 AT A   TIME.TO MOVE TO THE N
EXT ONE YOUMUST TYPE THE CURRENT
 SELECTION CORRECTLY 4 TIMES."
1003 PRINTTAB(6)"1> ASDF"
1004 PRINTTAB(6)"2> JKL;"
1005 PRINTTAB(6)"3> TGUH"
1006 PRINTTAB(6)"4> QWEV"
1007 PRINTTAB(6)"5> POIN"
1008 PRINTTAB(6)"6> BRNY":PRINTT
AB(6)"<PLUS 12 MORE>"
1009 PRINT"****<PRESS ANY KEY TO
 START>***";:PLAY"T150V3105GGGG"
1010 I$=INKEY$:IF I$=""THEN1010
1011 PLAY"T150V3105GGGG"
1012 A$(1)="SFAD":A$(2)="FADS":A
$(3)="KJL;":A$(4)="J;LK":A$(5)="
GHTU":A$(6)="UGHT"
1013 A$(7)="WEVN":A$(8)="VEWQ":A
$(9)="INOP":A$(10)="PINO":A$(11)
="XZTR":A$(12)="BRNY"
1014 A$(13)="CLOD":A$(14)="SEKP"
:A$(15)="TYUI":A$(16)="REOP":A$(
17)="MVWH":A$(18)="DALK"
1015 FOR X=1 TO 18:GOSUB4000:NEX
TX
1016 GOTO 15
2000 CLS:PLAY"T150V3105GGGG":PRI
NT"BELOW ARE SEVERAL INTERMEDIAT
E  EXERCISES.  AS IN THE BEGINNE
R  EXERCISES, THEY ARE BASICALLY
   FOR LEARNING  KEY LOCATION.
2001 PRINT:PRINT"EXERCISES INCLU
DE:"
2002 PRINTTAB(4)"1> A1S2D3F4"
2003 PRINTTAB(4)"2> T56Y7K86"
2004 PRINTTAB(4)"3> R-/.K-O"
2005 PRINTTAB(4)"4> CATJOBTIP"
2006 PRINTTAB(4)"5> EXCLAIMIT"
2007 PRINTTAB(4)"6> !W%V()$'"
2008 PRINTTAB(4)"-AND 12 MORE!"
2009 PRINT:PRINT"<PRESS ANY KEY
TO START>"
2010 I$=INKEY$:IF I$=""THEN2010
2011 PLAY"T150V3105GGGG":A$(1)="
A1S2D3F4":A$(2)="T56Y7K86":A$(3)
="R:/.K-O":A$(4)="CATJOBTIP":A$(
5)="EXCLAIMIT":A$(6)="!W%V()$'":
A$(7)="A;SLDKFJ":A$(8)="IEQUAY":
A$(9)="9ECLIDS"
2012 A$(10)="QPWOEI":A$(11)="RAZ
ELBOP":A$(12)="FELKROLO":A$(13)=
"KRIPNIC":A$(14)="DANLOUP":A$(15
)="ARKNORP":A$(16)="POINTER":A$(
17)="THRISG":A$(18)="FLIPGUT"
2013 FOR X=1 TO 18:GOSUB 4000:NE
XT X
2014 GOTO15
3000 CLS:PLAY"T150V3105GGGG":PRI
NT STRING$(32,175);
3001 PRINTSTRING$(12,175)+"ADVAN
CED"+STRING$(12,175);
3002 PRINTSTRING$(32,175)
3004 PRINT"YOU WILL BE GIVEN A S
HORT PHRASEOR SENTENCE TO TYPE.T
YPE AS FASTAS YOU CAN BUT TYPE A
CCURATELY."
3005 PRINT:PRINTSTRING$(32,128);
3006 PRINTCHR$(128)+"<PRESS ANY
KEY FOR 1ST PHRASE>"+CHR$(128);:
PRINTSTRING$(32,128);:PRINT"YOU
MUST TYPE 24 PERFECT PHRASES";:P
RINTSTRING$(32,"*");:PRINT"TIMER
 STARTS WHEN PHRASE APPEARS";:PR
INTSTRING$(32,"*")
3007 TY=0:I$=INKEY$:IF I$=""THEN
3007 ELSE CLS:PLAY"T255V3105EFEF
EF"
3008 E$(1)="NOW IS THE TIME FOR
ALL GOOD MEN"
3009 E$(2)="EVERY GOOD BOY WILL
HAVE HIS DAY"
3010 E$(3)="THERE IS NOTHING STO
PPING ME NOW"
3011 E$(4)="ROSES ARE RED-VIOLET
```

```
S ARE VIOLET"
3012 E$(5)="MANY A GOOD MAN HAS
GONE ASTRAY."
3013 E$(6)="I LOVE TO TYPE WITH
MY OWN COCO"
3014 E$(7)="THE SLY FOX WILL GET
 THE CHICKEN"
3015 E$(8)="COMPUTERS ARE NOT AC
TUALLY SMART"
3020 FOR Z=1 TO 3:FOR X=1 TO 8
3021 PRINTSTRING$(32,175);
3022 PRINT"YOUR PHRASE IS-"
3023 PRINT:PRINTE$(X)
3024 PLAY"T150V31O5GGGG"
3030 TIMER=0:LINE INPUT AN$
3031 IF AN$=E$(X)THEN PLAY"T4O3L
15P20O4CP20O4CP20EP20L12CP10L24E
P20L3G":GOTO3036
3034 IF AN$<>E$(X)THEN SOUND 1,4
:PRINT:PRINT:PRINT"***********E R
 R O R !************":GOTO3040
3036 PRINT:PRINT:PRINT"**********
*C O R R E C T**********";:TY=TY+
1:PRINT@420,"PERFECT PHRASES SO
FAR= "TY:PRINT"**YOUR SPEED WAS
";FIX(3600/TIMER)*9;"WORDS/MIN";
3040 FOR DL=1 TO 1600:NEXT DL
3041 CLS:IF TY=24 THEN 3055
3045 NEXT X:NEXTZ
3046 CLS
3047 IF TY<24 THEN3008
3050 END
3055 CLS:PRINT:PRINTSTRING$(32,1
75);:PRINT"IN HONOR OF YOUR  COM
PLETION OF ALL REQUIRED EXERCISE
S YOU ARE  HEREBY GRADUATED AND
AWARDED  A GOLD MEDAL!":PRINTSTR
ING$(32,159);:FOR DL=1 TO 1000:N
EXT DL
3056 PMODE 1,1:SCREEN 1,0:PCLS
3057 DRAW"C2BM96,96U20L7R15"
3058 DRAW"C2BM116,96;U20D10R10U1
0D20"
3059 DRAW"C2BM136,96;U20R10L10D1
0R10L10D10R10"
3060 DRAW"C2BM96,126;U20R10L10D1
0R10L10D10R10"
3061 DRAW"C2BM118,126;U20F20U20"
3062 DRAW"C2BM146,126;U20R7F5D10
G5L7"
3063 CIRCLE(60,100),25,2
3064 PAINT(60,100),2,2:CIRCLE(60
,100),20,3
3065 DRAW"BM60,145;G4BE4D40R4BRL
4L4"
3066 LINE(50,140)-(70,190),PSET,
B
3067 LINE(60,140)-(60,125),PSET
3080 GOTO3080
4000 CLS:TI=0:PRINTSTRING$(32,"*
")
4001 PRINT@64,"HERE IS YOUR EXER
CISE:":PRINT@96,CHR$(128)+A$(X)+
CHR$(128)
4002 PRINT@128,"TIMES PERFECT="T
I
4005 PRINT@192,"TYPE:":INPUTAN$:
IFAN$=A$(X)THENTI=TI+1
4006 IF AN$=A$(X)THENPRINT@128,"
TIMES PERFECT=";TI:SOUND125,1
4007 IF AN$<>A$(X)THENSOUND 1,1
4008 FOR DL=1 TO 20:NEXT DL
4009 PRINT@192,"              ":IF
TI<4 THEN 4005
4010 IF TI=4 THEN PLAY"T2O3L16CP
16O2L32GP32GP32L8AGP9L16BP16O3C"
:IF TI=4 THEN RETURN
5999 END
6000 DATA A,,B,E,G,I,N,N,I,N,G,,
T,Y,P,I,N,G,,P,R,O,G,R,A,M
6002 PR=259
6004 FORX=1TO26
6006 READ B$
6008 PRINT@PR,B$;
6010 PLAY"T255V31O2EE"
6012 FORDL=1TO50:NEXTDL
6014 PR=PR+1
6016 NEXTX
6018 RETURN
```

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MINIMUM REQUIREMENTS 16K EXTENDED BASIC $24.95
See review of this program in Dec. '83 Rainbow, page 259.

SUBTRACTION DRILL—for kindergarten through fourth grade designed to be used individually or with large groups; auto run and menu driven 10 levels: 1) sequential facts 0-0 through 5-5, 2) sequential facts 6-6 through 10-10, 3) random facts 0-0 through 5-5, 4) random facts 6-6 through 10-10, 5) minuend to 99 with no regrouping, 6) random facts 10 to 18, 7) minuend to 999 with no regrouping, 8) minuend to 99 with borrowing A10 (carry aide tutor provided), 9) minuend to 999 with borrowing A10, and 10) minuend to 999 with borrowing 10's and 100's. Large colorful numerals presented in vertical columns with right to left progression. Computer displays correct answer after 2 misses. Erase and quit options. Rewards provided.
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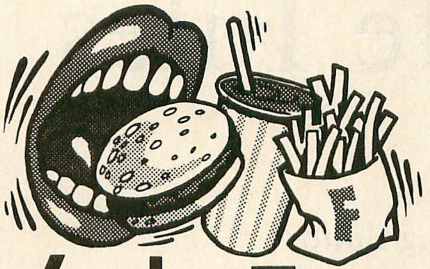

WackyFood!

Hamburgers, fries, drinks and other fastfoods are chased by chattering teeth. Can you stop them before you go...WACKO? *Three levels of play from beginner to expert.* This is number one for fun.
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Push blocks of ice to crush giant mosquitos and avoid getting stung long enough to get them all. *Three levels with graphics so real you'll want your fly swatter.* Don't miss this arcade classic.
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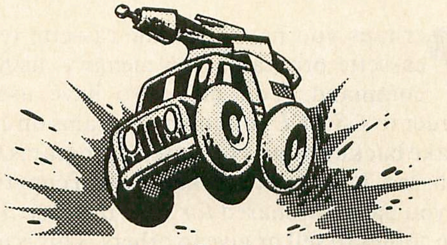

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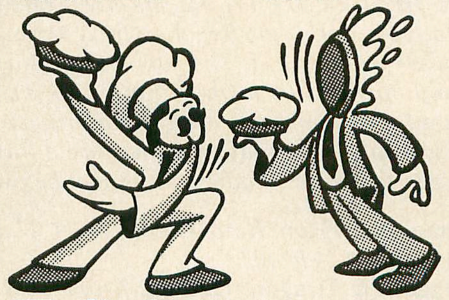

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A Beginner's Guide To Cassette Files

By Bob Albrecht
Rainbow Contributing Editor

Fantasy Role Playing Games

Millions of young people, and many not-so-young, are playing fantasy role playing games. A role playing game is a game in which one or more players create and control characters (adventurers) who live their imaginary lives in a specially made game world. The game world is created, managed, and operated by a GameMaster (GM), also called a referee, adventure master, or dungeon master (DM). Most people who play role playing games use a formal rule system. Some of the best known are shown below.

Champions. *From Hero Games, 92A 21st Avenue, San Mateo, CA 94402.*
Dungeons & Dragons (D&D). *From TSR Hobbies, P.O. Box 756, Lake Geneva, WI 53147.*
RuneQuest (RQ). *From Chaosium, P.O. Box 6302, Albany, CA 94706.*
Tunnels & Trolls (T&T). *From Blade, Box 1467, Scottsdale, AZ 85252.*
Worlds of Wonder (WOW). *From Chaosium, P.O. Box 6302, Albany, CA 94706.*

BEGINNERS BEWARE! The rule books are very difficult to understand. If you are a beginner, first try **Worlds of Wonder** *or* **Tunnels & Trolls. Programs in "GameMaster's Apprentice" are based on the game system used in Worlds of Wonder** *and* **RuneQuest.** *For general information about fantasy role playing games, try the following book, excellent for beginners.*

Through Dungeons Deep *by Robert Plamondon. From Reston Publishing Company, 11400 Sunset Hills Road, Reston, VA 22090.*

Copyright (c) 1983 by DragonQuest, P.O. Box 310, Menlo Park, CA 94025. Portions of "GameMaster's Apprentice" are from a book-in-progress called **Adventurer's Handbook: A Beginner's Guide to Role Playing Games** *by Bob Albrecht and Greg Stafford. To be published January, 1984 by Reston Publishing Company, 11400 Sunset Hills Road, Reston, VA 22090.*

Perhaps you have used the cassette recorder to load cassette programs into memory, using the *CLOAD* command. You may also have used the cassette recorder to *CSAVE* your own programs on cassette tapes or to make backup copies of cassette programs which you have purchased. It is okay to make copies of copyrighted software that you have purchased *for your own use.* It is *not okay* to make copies to sell or give to others. This is unfair to people who invest their time and money to provide good, inexpensive software and is illegal as well.

- When you *CSAVE* a program, the CoCo records the program from its memory onto a cassette, using the cassette recorder.

CSAVE: FROM MEMORY TO TAPE

MEMORY

- When you *CLOAD* a program, the CoCo reads the program from a cassette into its memory, again using the cassette recorder.

CLOAD: FROM TAPE TO MEMORY

MEMORY

You can also use the cassette recorder to store data (information) on cassettes and read data from cassettes into the CoCo's memory. The data can consist of numbers or strings or a mixture of both. So, this information can be

---

(Bob Albrecht and George Firedrake are two of the most prolific authors in the microcomputer world today. Specialists in writing for beginners, they are authors of numerous books, including TRS-80 Color BASIC.)

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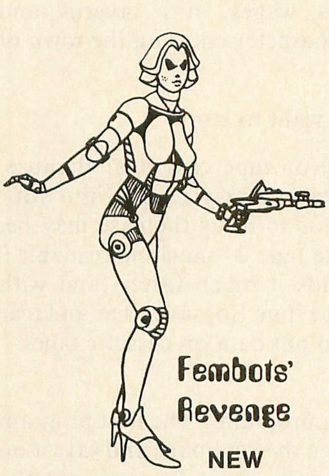

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Coming Soon

THE SENTINEL

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A dark, awful secret is hidden in the cavernous labyrinth. Beyond the chasms, the poisonous gasses, Tunnels of No Return and the relentless minions, the Sentinel hungrily awaits! Sorcerous magick and saintly swordplay are your best friends and worst enemies. You are no ordinary warrior in this ultra hi-res, 3-D medieval adventure! Can you survive to discover the secret - or is there a seat in the netherworld for you too?

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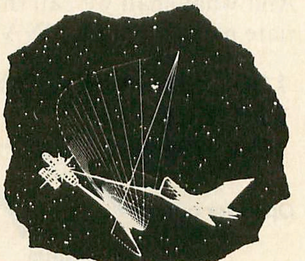

Xygoid

NEW

Your ship is being enshrouded by the Xygoid Web. Certain death is minutes away! You must blast through the enveloping Web and destroy the Xygoid vessel before you are crushed. This is a multi-colored machine-code game in the highest resolution mode on a black background. Xygoid, from the galactic beginning! It will ensnare your mind!

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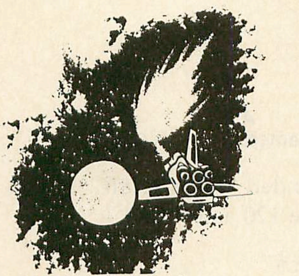

KOMET-KAZE

Another arcade hit! The Asteroid Belt is crashing down on Earth. You are the first-line defense. You must destroy the blazing asteroids and the homing orbs with your disruptor. Machine-code speed, multi-colors on a black background - the crash and explosions of the asteroids rain on your senses!

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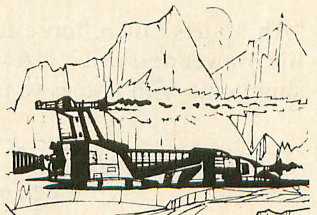

INTERCEPTOR

Ever increasing Waves of Landers, Fighters, Air mines and Smartbombs help the enemy capture the Earthlings on the planet surface. Your phaser and photon bombs will be a solid defense. In multi-colored surroundings you do battle to maintain control of your homebase!

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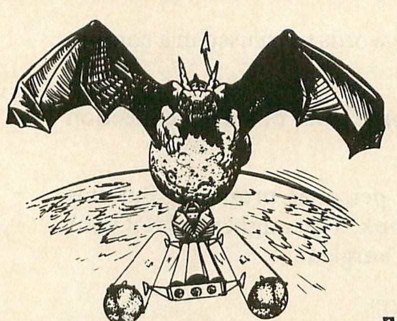

Fÿr-Draca

NEW ARCADE GAME

Fyr-Draca (Fire Dragons), from egg to the daemonic behemoth, greet you in five waves with nine colors on the screen at one time! This machine code game is going to sweep the Color Computer market. It is by far, the best game to come out for a long, long time. The real arcade look is here at last!

Fire Dragons uses the nine color mode to create a screen of dazzling color with a black background and a black border. Dragons swoop from their stellar watch, singly, in groups and in squadron formation. First you face the single wyrms, then the squadron, next the twin giants, followed by the Battle Drake and its minions. Even with four star vessels and shields you will be hard put to survive their spitting fire and diving attacks!

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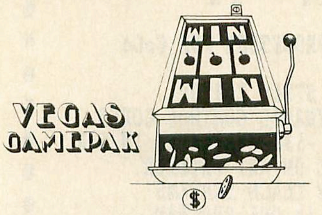

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MS. NIBBLER

Ms. Nibbler is not just another pretty face with glossy red lips. She's a feisty lady, who moodily prowls her black maze. This game has the real arcade action and the real arcade look too! Your joystick will almost burn out as you try to keep up!

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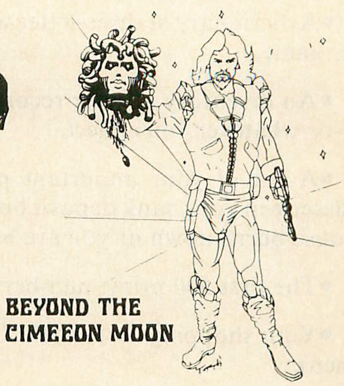

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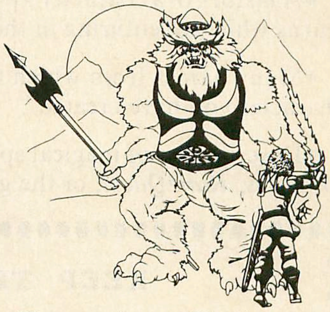

Adventure Trilogy

3-D GRAPHIC ADVENTURE

Clash steel with thy foe in the arena of gore. Proved worthy, go in quest of the elusive Eye of Dazmor. If ye findest the orb, hast ye the might to ward off skem and the fortitude to restore the Eye? The ultimate high-res, 3-D quest for even the most experienced adventurer!

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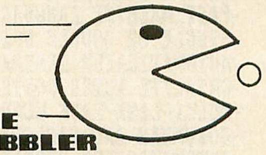

THE NIBBLER

The King of Pac games is here. This fast-paced maze-chase game will challenge the most skilled. You guide The Nibbler through the maze, the portals, onward to the Energy Pills. Then the Ghouls, constantly at your heels, will end up in your belly! The better you get the better you have to become to master the blazing speed. You haven't pushed your skill until you've tried this one!

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•A dictionary of three-letter words to be used in a computer game.

•An inventory of your record, coin, or stamp collection —or whatever you collect.

•A list of your important personal property. Put this cassette in your bank deposit box. You might need it if your house burns down or you are burgled!

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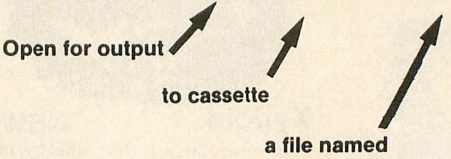
It's Easy!

Start with two short, simple programs. The first program lets you enter information from the keyboard and save it on tape. Of course, this information must first go into the memory of the CoCo. That's why we call this program *KEYBOARD-MEMORY-TAPE.*

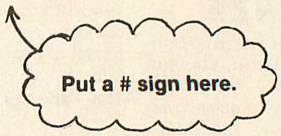
Our program helps you store names on a cassette tape. Well, if you want to store a string that is not a name, that's okay. The CoCo doesn't care. First, we clear the screen and tell the CoCo we want to *OPEN* a file for output ("O"). Output to where? To the cassette recorder (-1), of course. And what shall we call this file? We do believe an appropriate name would be "NAMES."

```
100 REM**KEYBOARD-MEMORY-TAPE
110 CLS
120 OPEN "O", -1, "NAMES"
```

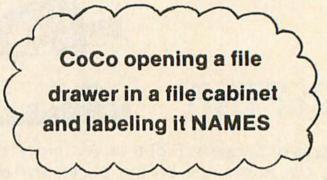


Line 120 is written for Extended Color BASIC. If you are using Color BASIC, write Line 120 as follows.

120 OPEN "O", #-1, "NAMES"


Put a # sign here.

"Ah," purrs CoCo, "my esteemed human wants me to open a file drawer and call it NAMES. Perhaps she or he will then supply me with names to put into NAMES."


CoCo opening a file drawer in a file cabinet and labeling it NAMES

Indeed, CoCo, we will add to your program so your human can enter names from the keyboard and you can store them in your open file called NAMES. The next piece of our program prompts your human to enter a name.

```
200 REM**KEYBOARD TO MEMORY
210 INPUT "NAME"; NAYM$
```

The CoCo waits patiently until its human types a name (or any string) and presses [ENTER], then it outputs (writes, records . . .) whatever was typed onto the cassette tape.

```
300 REM**MEMORY TO TAPE
310 PRINT #-1, NAYM$
```

Print

to cassette

the value of

What next? We need a way to tell the CoCo that we are finished entering names and to please *CLOSE* the file and stop.

```
400 REM**DO AGAIN IF NOT ENDFILE
410 IF NAYM$<>"ENDFILE" THEN 210
420 CLOSE -1
430 STOP
```

If the value of NAYM$ is *not* ENDFILE, the CoCo goes back to Line 210 and asks for another name. If you enter ENDFILE as the name, the CoCo puts it on the cassette tape then, thanks to Line 410, goes on to Line 420, closes the file, and stops. The last thing on the cassette will be ENDFILE, followed by an End-Of-File *(EOF)* mark. If you are using Color BASIC instead of Extended Color BASIC, change Line 420 to: 420 CLOSE #-1.

```
100 REM**KEYBOARD-MEMORY-TAPE
110 CLS
120 OPEN "O", -1, "NAMES"

200 REM**KEYBOARD TO MEMORY
210 INPUT "NAME"; NAYM$

300 REM**MEMORY TO TAPE
310 PRINT #-1, NAYM$

400 REM**DO AGAIN IF NOT ENDFILE
410 IF NAYM$<>"ENDFILE" THEN 210
420 CLOSE -1
430 STOP
```

Try The Program . . . Carefully!

Enter the program and try it. Do this carefully. We wish you success on your very first try. Slow is good.

Start by finding a high quality, never-before-used tape cassette. Don't (repeat: DON'T) use just any old cheap cassette. Treat your CoCo to the best, if you want the best from it.

Next, examine the cassette. Most cassettes have lots of magnetic tape and . . . very important . . . a few inches of leader. Leader? Rewind the tape. The first few inches probably consist of *non-magnetic* leader, usually clear plastic, or yellow, or red, or blue, or any color other than dull brown. Dull brown is the color of magnetic tape.

YOU CAN'T RECORD ON LEADER

Is the program in memory? Yes? Good. Pop the cassette into the recorder.

- Rewind the cassette.

- Then, run it forward a few inches so magnetic tape, not leader, is in position to receive your data.

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- Vowel Combinations	2, 3, 4, 5/6
- Blends/Digraphs	K-1, 2
- Contractions	2
- Synonyms	3, 4, 5/6
- Antonyms	3, 4, 5/6
- Possessives	5/6
- Plurals	3, 4
- Pre-Fixes	4, 5/6
- Suffixes	4, 5/6
- Syllables	3, 4, 5/6
- Accents	5/6
- Vocabulary	5/6

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Skill	Grade Level
- Before & After	2
- Math:	K-6
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Subtraction	
Multiplication	
- Division	4, 5/6
- Roman Numerals	5/6
I-C	
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- Press both [PLAY] and [RECORD] on the cassette recorder. Nothing should happen. If the tape starts to move, you probably don't have the recorder properly hooked up to the CoCo.

- Set the volume control on the cassette recorder to 4 or 5 or whatever works when you use *CSAVE* and *CLOAD*.

- Type *RUN* and press [ENTER]. The record light will come on briefly on the recorder and the tape will move as the CoCo opens the file. Soon the screen looks like this.

This is what you see:

```
NAME ■
```

- Type a name and press [ENTER]. You can enter the name of your choice, then type ENDFILE as the last name. When you enter ENDFILE, the CoCo will write the names on the tape—you will see the record light come on and the tape move. Here is what happened when we entered names.

```
NAME? ALOYSIOUS
NAME? BAROSTAN
NAME? BRIDLA
NAME? DERNFARA
NAME? JOLEEN
NAME? ROKANA
NAME? RURIK
NAME? ENDFILE
BREAK IN 420
OK
■
```

TAPE MEMORY TO SCREEN

We also wrote a program to read the names from the cassette tape and put them on the screen. First, we OPEN a cassette file for input.

```
500 REM**TAPE-MEMORY-SCREEN
510 CLS
520 OPEN "I", -1, "NAMES"
```

Open for input

from cassette

a file named

If you are using Color BASIC, change Line 520 to:

520 OPEN "I", #-1, "NAMES"

Next, check for End-Of-File *(EOF)*. If *EOF* has been reached, go to Line 910 and close the file. Otherwise, input a name from the cassette and store it as the value of NAYM$.

```
600 REM**TAPE TO MEMORY
610 IF EOF (-1) THEN 910
620 INPUT #-1, NAYM$
```

Print the name on the screen and go back for more.

```
700 REM**MEMORY TO SCREEN
710 PRINT NAYM$

800 REM**GO FOR ANOTHER
810 GOTO 610
```

When the CoCo reads the End-Of-File mark, Line 610 sends it to Line 910.

```
900 REM**CLOSE THE FILE
910 CLOSE -1
920 STOP
```

For Color BASIC: 910 CLOSE #-1

Here are both programs.

```
100 REM**KEYBOARD-MEMORY-TAPE
110 CLS
120 OPEN "O", -1, "NAMES"

200 REM**KEYBOARD TO MEMORY
210 INPUT "NAME"; NAYM$

300 REM**MEMORY TO TAPE
310 PRINT #-1, NAYM$

400 REM**DO AGAIN IF NOT ENDFILE
410 IF NAYM$<>"ENDFILE" THEN 210
420 CLOSE -1
430 STOP

500 REM**TAPE-MEMORY-SCREEN
510 CLS
520 OPEN "I", -1, "NAMES"

600 REM**TAPE TO MEMORY
610 IF EOF (-1) THEN 910
620 INPUT #-1, NAYM$

700 REM**MEMORY TO SCREEN
710 PRINT NAYM$

800 REM**GO FOR ANOTHER
810 GOTO 610

900 REM**CLOSE THE FILE
910 CLOSE -1
920 STOP
```

To run *KEYBOARD-MEMORY-TAPE*

- Position the cassette and set the volume.
- Press [RECORD] and [PLAY] on the recorder.
- Type *RUN* and press [ENTER].

To run *TAPE-MEMORY-SCREEN*

- Position the cassette and set the volume.
- Press [PLAY] on the recorder.
- Type *RUN 510* and press [ENTER].

Remember, Lines 120, 420, 520, and 910 work in Extended Color BASIC. If you are using Color BASIC, put a number sign (#) in front of the device number (-1) in each of these statements.

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THE MEMORY GAME

by Michael Popovich

Have you ever played the popular concentration card game where, by placing 52 playing cards face down, you must try to match two cards at a time by turning them over simultaneously? Well, here's a fun game based on the same concept called *The Memory Game,* requiring two players.

When the program is run, forty squares appear on the screen. The CoCo takes a few seconds to set up the grid, placing 20 matching letters randomly behind the 40 squares. When this is done, the screen will flash and a small verticle line will appear at the top of the screen. This signals player one. If player one gets a match, he/she wins an extra turn and one vertical line will remain. If the player doesn't make a match, the squares will be covered and two verticle lines will appear signifying player two's turn. The score will be displayed at the end of the game.

The small red square, identifying the player's move, is placed inside the larger square in the upper left corner of the grid. It can be moved as follows:

Q — Up
A — Down
P — Left
@ — Right
L — Look at what is behind the square.

200	01BA
330	045B
580	07B3
END	0B01

The listing:

```
1 '   BY   MICHAEL POPOVICH
3 '        6 ALEX CIRCLE
5 '        NASHUA NH  03062
7 '
10 T=0:MM=1:Z=1
20 DIM L(50),B$(25)
30 PMODE 3,1:PCLS:SCREEN 1,0
40 FOR A=0 TO 220 STEP 30
50 FOR C=40 TO 160 STEP 30
60 LINE (A,C)-(A+20,C+20),PSET,B
70 PAINT (A+2,C+2),2,4
80 LINE(8+A,8+C)-(13+A,13+C),PRE
SET,BF
90 NEXT C
100 NEXT A
110 LINE (8,48)-(13,53),PSET,BF
120 R=RND(40)
130 T=T+1
140 IF T=41 THEN 210
150 L(T)=R
160 IF T=1 THEN 120
170 FOR M=1 TO T-1
180 IF L(M)=R THEN T=T-1:GOTO 12
0
190 NEXT M
200 GOTO 120
210 PL=1:SOUND 50,1:SCREEN 1,1:F
OR W=1 TO 100:NEXT W:SCREEN 1,0:
DRAW "BM123,5;D10"
220 A$=INKEY$
230 IF A$="L" GOSUB 340
240 IF A$="P" AND ZX=0 THEN LINE
(8+X,48+Y)-(13+X,53+Y),PRESET,BF
 :X=X-30:J=1:Z=Z-1:ELSE IF A$="P
" AND ZX=1 THEN X=X-30:J=1:Z=Z-1
250 IF A$="@" AND ZX=0 THEN LINE
(8+X,48+Y)-(13+X,53+Y),PRESET,BF
:X=X+30:J=1:Z=Z+1:ELSE IF A$="@"
 AND ZX=1 THEN X=X+30:J=1:Z=Z+1
260 IF A$="A" AND ZX=0 THEN LINE
(8+X,48+Y)-(13+X,53+Y),PRESET,BF
:Y=Y+30:J=1:Z=Z+8:ELSE IF A$="A"
 AND ZX=1 THEN Y=Y+30:J=1:Z=Z+8
270 IF A$="Q" AND ZX=0 THEN LINE
(8+X,48+Y)-(13+X,53+Y),PRESET,BF
:Y=Y-30:J=1:Z=Z-8:ELSE IF A$="Q"
```

(Michael Popovich is a student at Keene State College. This is his first publication and he hopes to have more.)

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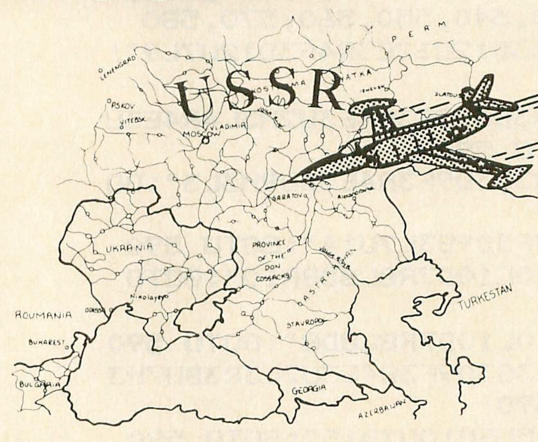
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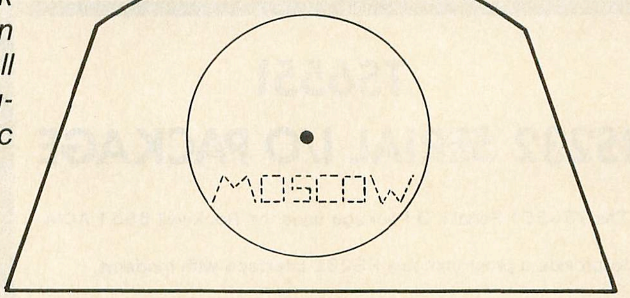

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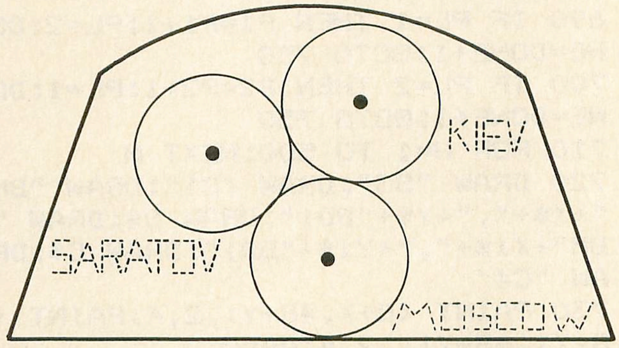
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```
 AND ZX=1 THEN Y=Y-30:J=1:Z=Z-8
280 IF X<0 THEN X=0:Z=Z+1
290 IF X>210 THEN X=210:Z=Z-1
300 IF Y<0 THEN Y=0:Z=Z+8
310 IF Y>120 THEN Y=120:Z=Z-8
320 IF J=1 THEN LINE (8+X,48+Y)-
(13+X,53+Y),PSET,BF:J=0:ZX=0
330 GOTO 220
340 ZZ=L(Z)
350 X$=STR$(X+6):Y$=STR$(Y+45)
360 X1$=STR$(X1+6):Y1$=STR$(Y1+4
5)
370 IF ZZ>20 THEN ZZ=ZZ-20
380 ON ZZ GOTO 390,400,410,420,4
30,440,450,460,470,480,490,500,5
10,520,530,540,550,560,570,580
390 B$="BD3D12U12E3R4F3D12U7L9":
GOTO 590
400 B$="BR3G3D9F3R4E3U2H3L4R4E3U
2H3L4":GOTO 590
410 B$="BR3G3D9F3R4E3BU9H3L3":GO
TO 590
420 B$="R7F3D9G3L7U14":GOTO 590
430 B$="R10L10D7R8L8D8R10":GOTO
590
440 B$="R10L10D7R8L8D8":GOTO 590
450 B$="BR3G3D9F3R4E3U2L3R3BU7H3
L4":GOTO 590
460 B$="D15U8R10U7D15":GOTO 590
470 B$="R9L5D15L4R9":GOTO 590
480 B$="BD12F3R4E3U12":GOTO 590
490 B$="D15U8R2E7G7F8":GOTO 590
500 B$="D15R10":GOTO 590
510 B$="D15U15R6D9U9R6D15":GOTO
590
520 B$="D15U15F10U10D15":GOTO 59
0
530 B$="BR3G3D9F3R4E3U9H3L4":GOT
O 590
540 B$="BD3D12U12E3R4F3D2G3L4":G
OTO 590
550 B$="BD3D12U12E3R4F3D2G3L4F8"
:GOTO 590
560 B$="R9L5D15":GOTO 590
570 B$="D13F2R6E2U13":GOTO 590
580 B$="D3F9D3U3H5G5D3U3E9U3":GO
TO 590
590 FOR G=1 TO V
600 IF B$=B$(G) THEN SOUND 1,1:R
ETURN
610 NEXT G
620 LINE(8+X,48+Y)-(13+X,53+Y),P
RESET,BF:ZX=1
630 PAINT (8+X,48+Y),1,4
640 DRAW "S3":DRAW "BM"+X$+","+Y
$+"BD1":DRAW B$
650 AA=AA+1
660 IF AA=1 THEN C$=B$:X1=X:Y1=Y
:RETURN
670 IF AA=2 AND C$=B$ AND X=X1 A
ND Y=Y1 THEN SOUND 1,1:AA=AA-1:R
ETURN
680 IF AA=2 AND C$=B$ THEN PAINT
 (2+X,48+Y),2,4:PAINT (2+X,48+Y)
,1,1:PAINT (2+X1,48+Y1),2,4:PAIN
T (2+X1,48+Y1),1,1:AA=0:V=V+1:B$
(V)=B$:J=1:ELSE 710
690 IF PL=1 THEN P1=P1+1:PL=2:DO
NE=DONE+1:GOTO 750
700 IF PL=2 THEN P2=P2+1:PL=1:DO
NE=DONE+1:GOTO 750
710 FOR H=1 TO 500:NEXT H
720 DRAW "S3":DRAW "C1":DRAW "BM
"+X$+","+Y$+"BD1":DRAW B$:DRAW "
BM"+X1$+","+Y1$+"BD1":DRAW C$:DR
AW "C4"
730 PAINT (8+X,48+Y),2,4:PAINT (
8+X1,48+Y1),2,4:AA=0
740 LINE(8+X,48+Y)-(13+X,53+Y),P
RESET,BF:LINE(8+X1,48+Y1)-(13+X1
,53+Y1),PRESET,BF:J=1
750 IF PL=1 THEN PL=2:DRAW "BM12
3,5;D10":DRAW "BM133,5;D14":GOTO
 770
760 IF PL=2 THEN PL=1:DRAW "C1":
DRAW "BM133,5;D14":DRAW "C4"
770 IF DONE=20 THEN CLS:PRINT @1
92,"PLAYER 1 -"P1:PRINT @256,"PL
AYER 2 -"P2:END
780 RETURN
```

TS6551

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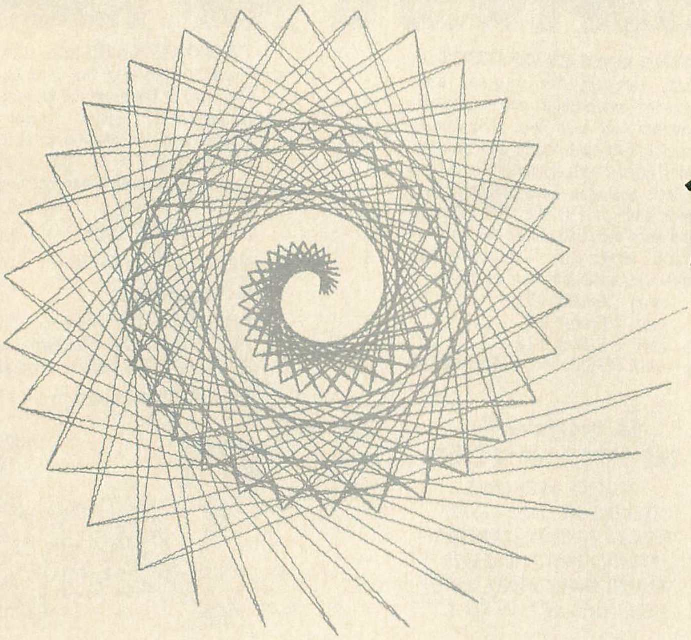


THE CGP-115 PRINTER:

'A Considerable Upgrade'

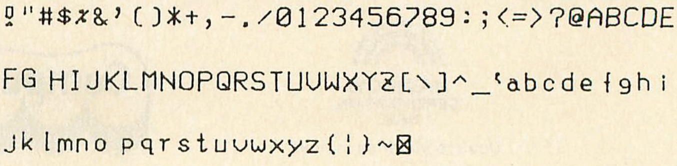
By Thomas Szlucha

Ever since early man first sketched paintings on the walls of his caves, he has been recording his ideas, feelings and dreams in some permanent fashion for later use. Modern man, with his Color Computer, also has this need for permanent storage. This need for hard copy is so important that many experts differentiate "toy" computers from "personal" computers by the availability of a printer on the system.

Radio Shack's small printer/plotter, the Color Graphics Printer (CGP-115), represents a considerable upgrade to the simple tools the cave man used for his work. Seriously, the CGP offers basic printing functions along with excellent graphics plotting. With the exception of serious word processing, this printer offers considerable performance in a small package at an affordable price ($249 in the 1983 Radio Shack Catalog — watch for sales).

The CGP-115 is being marketed by Tandy to be used with their entire line of computers. It has a standard parallel as well as a four-pin serial interface, a la CoCo. Unpacking, interfacing and setting up the printer takes about three minutes if you are slow. There is a set of dip switches on the back panel that allows programming for the particular application. For the Color Computer, these switches are set for serial input, 40 or 80 column text character size, line feed with carriage return, and 7 bit ASCII code.

The printer is small, about 8" x 8" x 3", using a 4½" wide roll of plain paper. Printed characters are formed by moving a small ballpoint pen in the horizontal direction while a roller platen moves the paper up and down vertically. The quality of the printing is excellent, in fact, the 80 column character set produces about 20 characters per inch which are very crisp and easy to read. The print quality by far exceeds that of the typical dot matrix printer, a definite plus for the CGP. Colors (black, red, green, blue) are provided by four pens built into a turret-like "print head." There are switches for power on, paper feed, color select, and pen change as well as a power on indicator light. At start-up, the printer goes through a routine of drawing four small squares, one with each pen, to verify that the ink is flowing properly. Holding the paper feed switch down during start-up results in a test printing of the character set. Figure 1 shows a test printing of the character set in the 40 column mode. The normal ASCII character set is supported with lowercase having true descenders.



```
!"#$%&'()*+,-./0123456789:;<=>?@ABCDE

FG HIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghi

jklmno pqrstuvwxyz{¦}~⊠
```

Figure 1

The printer defaults to the text mode after start-up with

(Thomas Szlucha, a project manager at Xerox Corp., is a frequent contributor to ***the Rainbow****. His hobbies include free-lance software writing.)*

the character size determined by the position of the DIP switch on the back panel. The control codes which are available in this mode are shown in Table 1. These are sent to the printer with the PRINT #-2, CHR$ (X) command in Color BASIC. Backspacing allows the capability of underlining and overstriking; reverse feed allows superscripting. Print speed in the text mode is claimed to be 12 cps, very slow. This slowness definitely trades off against quietness. You can't find a printer much quieter than the CGP.

Control Code	**Function**
CHR$ (08)	Backspace
CHR$ (10)	Line
CHR$ (11)	Reverse linefeed
CHR$ (13)	Carriage return
CHR$ (17)	Set text mode
CHR$ (18)	Set graphics mode
CHR$ (29)	Change colors

Table 1

The most exciting part of this printer is the graphics mode. A graphics plotter such as this is expected to have a comprehensive set of plotting commands, which it does. Commands are provided which allow you to draw from one point to another based on a 480 x 480 step grid pattern. You are able to specify position either relative to the current pen location or from a previously specified origin. Lines can be solid or varying degrees of "dashed." You can move the pen without drawing and change colors. There is also a command that draws the axis of a graph including the little "tic" marks along the side. The printer is capable of .2mm/step resolution (.0079"). This is so fine that closely drawn line patterns can exhibit moire patterns.

Unlike Color Computer graphics, the text capability with the CGP in the graphics mode is actually an enhancement over the normal text mode. There are commands to specify the written text size from 80 to one character per line. You are also allowed to rotate the text, ie, it can be normal, going sideways-down the sheet, sideways-up the sheet and upside-down.

The graphics functions used by the CGP are not identical to those provided by Extended Color BASIC. To draw a line on the screen with the Color Computer you can use the line command.

LINE (X1,Y1)-(X2,Y2), PSET

The CGP equivalent would be:

PRINT #-2, MX1,Y1" -move to X1,Y1
PRINT #-2, "DX1,Y1,X2,Y2" -draw to X2,Y2

It takes some familiarity but once mastered, the results can be quite spectacular.

The CGP comes with a 45-page operating manual that does a good job of explaining each command and gives many simple examples. Some previous knowledge of BASIC is assumed. If you decide to purchase the CGP, do pay attention to the technique described in the manual to change the pens. The printhead and surrounding mechanisms are somewhat delicate. I inadvertently bent a small, but important metal tab used to index the various pen colors with my fat thumb before realizing it. (These units are put together by people with very small hands.)

I discovered a very useful trick not described in the operating manual that I would like to share. It can be quite useful to run the graphics portion of the program in the text mode. In doing so, a line by line description of the graphics commands sent to the printer are listed on the printer along with the value of any associated variables. With this listing it can be relatively easy to spot mistakes, such as missing commas, which can wreak havoc with a piece of graphics art.

I have experienced only a few minor irritations with the CGP. During the power-up routine the pen holder is driven to the left frame and continues to attempt to move. This results in a grinding noise. Consultation with the local Radio Shack computer center indicates that this is a process needed to register the pen servo. Radio Shack should have given a warning about this noise so that new owners would not think they had a lemon on their hands. Another minor complaint is the lack of a circle command. This can be gotten around with a considerable sacrifice in speed by using a subroutine which draws a circle from line segments. This could have been easily built in as a command. My final complaint is that the pens are too small to hold much ink, therefore frequent servicing is required.

The attraction of color printing and plotting make the CGP-115 an ideal first printer for the CoCo owner in need of a hard copy device. If you have printer that you use for word processing and listings, you may be attracted to it as I was for its graphics capabilites.

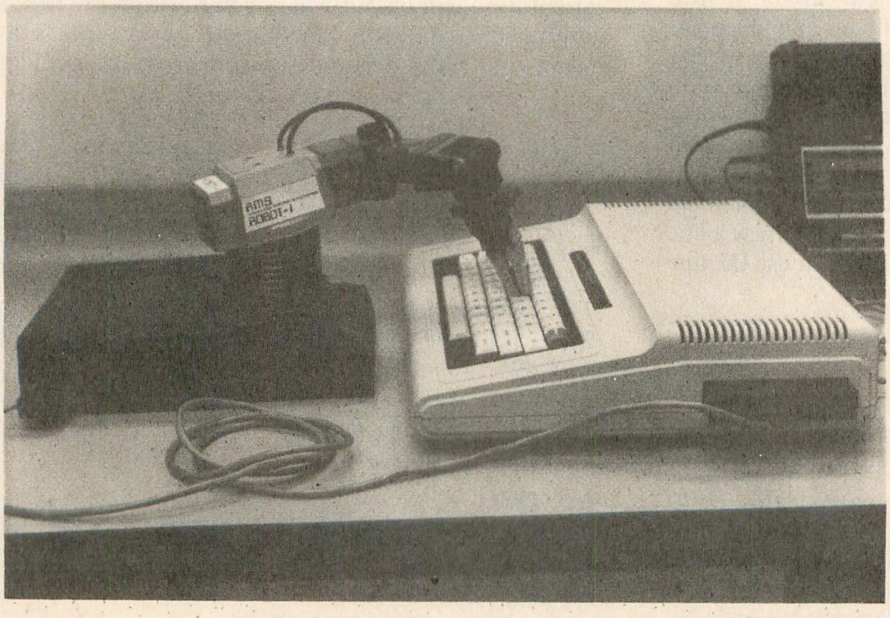
The program listing included with this review is entitled *Doodler*. It is a fun and perhaps useful program which exercises many of the functions which are available with the CGP-115. The pen is moved around the plotting area with a joystick. Please note that the pen movement is not as fast as you can move the joystick. This may cause some frustration if you are trying to move to a specific location. The easiest way to position the pen is to use the coordinate positions printed on the screen as a guide. With this program, lines can be drawn as well as circles and boxes. Text of any size and orientation can be put where you position the pen, and of course, this can all be done in different colors. Have fun using your computer to design a micro-plotter collage.

400	0342
870	068D
END	0970

The listing:

```
10 CLS
20 PRINT@197,"COLOR GRAPHICS DOO
DLER"
40 FOR T=1 TO 1000:NEXT
50 PRINT#-2,CHR$(18)
55 PRINT#-2,"I"
60 C=0
70 T1$="CURRENT COLOR =":T2$="PE
N POSITION ":T3$="MOVE PEN WITH
RIGHT JOYSTICK"
100 CLS: 'MAIN MENU
105 H=JOYSTK(0)*7.62:V=-JOYSTK(1
)*7.62
110 GOSUB 350
120 PRINT#-2,"C"C
130 PRINT@5,"480 X 480 COORDINAT
ES"
140 PRINT@ 32,T1$;C$
160 PRINT@128,T3$
```

```
170 PRINT@192,"SELECTIONS"
180 PRINT@224,"<D>RAW LINE"
190 PRINT@256,"<C>IRCLE"
200 PRINT@288,"<B>OX"
210 PRINT@320,"<P>RINT TEXT
220 PRINT@352,"<N>EW COLOR"
230 PRINT@384,"<Q>UIT"
235 PRINT@416,"SELECTION PLEASE:
"
240 K$=INKEY$
250 IF K$="D" THEN 400
260 IF K$="C" THEN 600
270 IF K$="B" THEN 800
280 IF K$="P" THEN 1000
290 IF K$="N" THEN 1200
300 IF K$="Q" THEN PRINT#-2,"A"
:CLS:END
305 H=JOYSTK(0)*7.61:V=-JOYSTK(1
)*7.61
310 PRINT@64,T2$;"X=";INT(H);"Y=
";INT(-V)
320 PRINT#-2,"M"H","V
330 GOTO 240
350 IF C=0 THEN C$="BLACK"
360 IF C=1 THEN C$="BLUE"
370 IF C=2 THEN C$="GREEN"
380 IF C=3 THEN C$="RED"
390 RETURN
400 CLS
410 H=JOYSTK(0)*7.61:V=-JOYSTK(1
)*7.61
420 PRINT@0,"DRAW SUBROUTINE"
430 PRINT@128,T3$
450 PRINT@192,"<X> TO EXIT
460 PRINT@32,T1$;C$
470 PRINT@64,T2$;"X=";INT(H);"Y=
"INT(-V)
480 K$=INKEY$
490 IF K$="X" THEN 100
500 IF K$="N" THEN 1200
510 PRINT#-2,"D"H","V
520 GOTO410
600 CLS
610 PRINT@0,"CIRCLE SUBROUTINE"
620 PRINT@32,T1$;C$
630 PRINT@64,T2$;"X=";INT(H);"Y=
"INT(-V)
640 PRINT@128,"INPUT RADIUS (1-2
40) ";:INPUT R
650 IF R>5 THEN PRINT@160,"CIRCL
ES ARE SLOW BUT WORTH IT"
660 PRINT#-2,"M"H","V+R
670 FOR Y=V+R TO V-R STEP -1
680 X=H+SQR(R*R-(Y-V)*(Y-V))
690 PRINT#-2,"D"X","Y
700 NEXTY
710 FOR Y=V-R TO V+R
720 X=H-SQR(R*R-(Y-V)*(Y-V))
730 PRINT#-2,"D"X","Y
740 NEXTY
```



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```
750 GOTO 100
800 CLS:D=0:B$=""
810 PRINT@0,"BOX SUBROUTINE"
820 PRINT@32,T1$;C$
830 H=INT(JOYSTK(0)*7.61):V=-INT
(JOYSTK(1)*7.61)
840 PRINT@64,T2$;"X=";H;"Y=";-V
850 IF D=0 THEN PRINT@128,"POSIT
ION PEN TO FIRST CORNER ANDPRESS
 <A>
860 IF D=1 THEN PRINT@128,"POSIT
ION PEN TO DIAGONAL CORNER AND P
RESS <Z>"
870 PRINT#-2,"M"H","V
880 B$=INKEY$
890 IF B$="Z" THEN 940
900 IF B$="A" THEN 910 ELSE 830
910 X1=H:Y1=V:B$="":D=1
920 PRINT#-2,"J1,0"
930 GOTO 830
940 X2=H:Y2=V:D=0
950 GOTO 970
960 PRINT#-2,"M"X1",Y1"
970 PRINT#-2,"D"X2","Y1","X1","Y
1","X1","Y2","X2","Y2
975 PRINT#-2,"M"H","V
980 GOTO100
1000 CLS: PRINT@0,"PRINT SUBROUT
INE":T$=""
1010 PRINT@32,T2$;C$
1020 PRINT@64, T2$;"X=";INT(H);"
Y=";INT(-V)
1040 PRINT@96," "
1050 INPUT"SELECT CHARACTER SIZE
 (0-63)";S
1060 PRINT@160,"ORIENTATION:"
1070 PRINT@192,"0= NORMAL       1
= RIGHTSIDE"
1080 PRINT@224,"2= UPSIDE DOWN 3
=LEFTSIDE"
1090 INPUT Q
1095 PRINT@288,"ENTER TEXT DESIR
ED"
1100 INPUT T$
1110 PRINT#-2,"S"S
1120 PRINT#-2,"Q"Q
1130 T$="P"+T$
1140 PRINT#-2,T$
1150 GOTO 100
1200 CLS:
1210 PRINT@0,"COLOR CHANGE"
1220 PRINT@32,T1$;C$
1230 PRINT@96,"0=BLACK      1=BLUE
"
1240 PRINT@128,"2=GREEN      3=RED
"
1250 PRINT@192,"COLOR DESIRED "
1260 INPUT C
1270 GOTO 100
```

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VISIBLE CHECK REGISTER

By Sid Brooks

Visible Check Register will provide you with a monthly record of your checking account and a summary by account number and dollar amount of where your money is being spent. All of this is easily saved and retrieved on tape.

This is my first computer program and I hope you enjoy running and modifying it as much as I have. It started out as the checkbook program on Page 227 of the manual.

After running that program as listed, I was disappointed to learn that the neat little table shown in the book never actually appeared on screen but was simply a table of the information being processed. The first step was to develop a display that looked as much as possible like my check book register, then, account totalizing, which is a very nice way to see where the family money is going.

When CoCo was turned off, all of the input was lost, so, the next development was input and output to tape. You can imagine, I'm sure, typing in 20 or 30 entries to see if the display scrolls properly only to realize that the [BREAK] button would again have to be pressed and another brainstorm would have to manifest itself to correct this or that. By this time, there were enough facets to the program to warrant a menu. Then came the edit feature and finally the jumping cursor. (No small feat). The listing represents 61 major modifications and approximately five months of learning.

I plan to add a bar graph to represent the account totals as they relate to a budget. This could be entered from tape as are the account names. Finally, output to a printer, and then it will be possible to do the accounting of a family or even a small business in a very professional manner with monthly statements and all.

If anyone would like a copy of this program on tape, please send $4 and a blank 30 minute cassette and I'll *CSAVE* it five times and check it to be sure each loads properly and then mail it right back to you.

To run the program, *CLOAD*"CHECKS" and follow this guide.

1. Type *RUN.*
2. Type Y or N for prior month review.
   A. If Y: load tape to be reviewed. Press play button on the recorder and [ENTER]. Previous listed accounts and entries will be available for all program functions.
   B. If N: You will be informed that 50 accounts are available and that you may use up to 14 spaces in their title.
3. Type number of accounts required and [ENTER].
4. Type name of account and [ENTER]. Continue until all accounts requested have been named.
5. The MENU should now appear.
6. Press [ENTER] and type the date of 1st entry using four digits. Example: 1131 for Nov. 31. Then, [ENTER].
7. Type three-digit number. Press [ENTER]. This number must be 111 to 999.
8. If this is first entry for the period, it should be entered as a deposit. Type D.
9. Type amount of the beginning balance using the decimal point in the normal fashion. Press [ENTER].
10. Entry will appear on the screen very similar to the way it appears in a check register.
11. Editing.
    A. If all looks correct press [ENTER] *two times* and continue.
    B. If a mistake has been made, press [DOWN ARROW] to activate the editing feature. The cursor will move to just below the last entry. Press the [UP ARROW] to position the cursor on the line needing correction. Now press [ENTER] two times and make the corrected entry. Press the [UP] and [DOWN ARROWS] to scroll. Press the [DOWN ARROW] until the cursor returns to the space just after the word POSITION at bottom of screen.
12. Press [ENTER] one time to return to the MENU.
13. It will save time to do the following:
    A. After typing names of accounts, insert a blank tape and press record and play buttons on the recorder and press 4.
    B. Label this tape for the family or business that it pertains to. Subsequent periods will not require typing in all the accounts if this tape is loaded in the same manner as a prior month review.

(Sid Brooks is a 1961 graduate of Miami, Florida's Coral Gables High School. He operates a computerized supply room for Louis Rich Foods in Newberry, SC by using IBM terminals hooked to a mainframe with Oscar-Mayer in Madison, WI.)

```
170.....025C 1090 ... 0E03
380.....04C4 1281 .. 10CA
580.....078A 1470 ... 03F0
830.....0AF9 END ... 1628
```

The listing:

```
10 CLS:PRINT@(200),"CHECK REGIST
```

```
ER                    S.G.BROOKS
                     NEWBERRY S
C"
20 FORJ=1TO1000:NEXTJ:J=0:CLS
30 DIMF$(39):DIMA(6,50)
40 DIMB(30):DIMC(30)
50 N$="DATE NUM #  DEP    CHECK
 BAL "
60 PRINT@(196),"PRIOR MONTH REVI
EW (Y/N)"
70 I$=INKEY$
80 IFI$="Y"THEN1650ELSE90
90 IFI$="N"THEN100ELSE70
100 PRINT@(194),"YOU MAY USE UP
TO 14 SPACES       EACH TO NAME UP
 TO 50 ACCTS":FORJ=1TO2000:NEXTJ
:J=0:CLS
110 CLS:PRINT@(196),"HOW MANY AC
COUNTS DO YOU         REQUIRE FOR
 THIS LISTING":INPUT"
   ";B
120 IFB>99 THEN 110
130 H=1
140 CLS:GOTO1420
150 CLS:W=W+1
160 IF B<1 THEN B=1
170  PRINT@ (198),"DATE OF TRANS
ACTION":PRINT:INPUT"
   ";A(1,W)
180 IF A(1,W)<101 OR A(1,W)>1231
 THEN 170
190 CLS
200 PRINT @(195),"NUMBER OF DEPO
SIT OR CHECK":PRINT:INPUT"
    ";A(2,W)
210 IF A(2,W)<111 OR A(2,W)>999
THEN 200
220 CLS
230 PRINT@(197),"TYPE (D) FOR DE
POSIT              TYPE (C) FOR CH
ECK   "
240 IF A(4,W)>0 THEN 320 ELSE 25
0
250 IF A(5,W)>0 THEN 870 ELSE 26
0
260 Y$=INKEY$
270 IF Y$<>"D" THEN 280 ELSE 320
280 IF Y$<>"C" THEN 230 ELSE 870
290 CLS
300 GOTO150
310 END
320 CLS:PRINT @(198),"AMOUNT OF
DEPOSIT":PRINT:INPUT"
  ";A(4,W):SOUND225,2:CLS:IF A(4
,W)<1 OR A(4,W)>9999.99 THEN 320
330 A(6,W)=A(6,(W-1))+A(4,W)
340 IF W>9 THEN WW=9
350 IF W<10 THEN M=W ELSE M=9
360 IF CC$=CHR$(94) THEN 380 ELS
E 370
370 CLS(1)
380 SET(8,0,1):SET(9,0,1):SET(8,
1,1):SET(9,1,1)
390 PRINT@(0),N$
400 S=1:GOTO420
410 S=S+1
420 IF W>9 THEN WW=WW-1
430 IF W>9 THEN SS=W-WW
440 IF W<10 THEN SS=S
450 IF A(1,SS)>0 THEN PRINT@(0+(
S*32)),USING"####";A(1,SS);
460 IF A(2,SS)>0 THEN PRINT@(4+(
S*32)),USING"####";A(2,SS);
470 IF A(3,SS)>0 THEN PRINT @(9+
(S*32)),USING"##";A(3,SS);
480 IF A(3,SS)=0 THEN PRINT@(9+(
S*32)),"  "
490 IF A(4,SS)>0 THEN PRINT @(11
+(S*32)),USING"####.##";A(4,SS);
500 IF A(4,SS)=0 THEN PRINT@(11+
(S*32)),"  "
510 IF A(4,SS)>0 THEN A(6,SS)=A(
6,(SS-1))+A(4,SS) ELSE 520
520 IF A(5,SS)>0 THEN PRINT@(17+
(S*32)),USING"####.##";A(5,SS);
530 IF A(5,SS)=0 THEN PRINT@(18+
(S*32)),"  "
540 IF A(5,SS)>0 THEN A(6,SS)=A(
6,(SS-1))-A(5,SS) ELSE 550
550 IF A(6,SS)<>0 THEN PRINT@(24
+(S*32)),USING"#####.##";A(6,SS)
;
555 IF A(6,(W+1))=A(6,W) THEN 57
0 ELSE 560
560 IF S>8 THEN 570 ELSE 410
570 PRINT@(0),N$
580 WW=0:SS=0
590 PRINT@(425),"POSITION
                THEN PRESS <ENTER>"
595 IF A(6,(W+1))=0 THEN 610 ELS
E 600
600 IF TT=0 THEN 610 ELSE 680
610 FOR X=2 TO 8
620 SET(44,26,X):SET(45,26,X):SE
T(44,27,X):SET(45,27,X)
630 CCC$=INKEY$
640 IF CCC$=CHR$(94) THEN 6[illegible]0 EL
SE 650
650 IF CCC$=CHR$(13) THEN 1280 E
LSE 660
660 IF CCC$=CHR$(10) THEN 680 EL
SE 670
670 NEXT X:GOTO610
680 PRINT@(434),"     "
690 IF W>8 THEN X=20 ELSE X=(W*2
)+2
700 IF CC$<>CHR$(94) THEN 710 EL
SE X=2
710 FOR DD=2 TO 8
720 SET(8,X,DD):SET(9,X,DD):SET(
8,(X+1),DD):SET(9,(X+1),DD)
730 CC$=INKEY$
740 IF CC$=CHR$(94) AND X>1 THEN
 750 ELSE 790
750 IF X>2 THEN 760 ELSE 770
760 SET(8,X,1):SET(9,X,1):SET(8,
(X+1),1):SET(9,(X+1),1):X=X-2
770 W=W-1:TT=TT+1:IF X<2 THEN X=
2
780 IF X=2 THEN 340 ELSE 790
790 IF CC$=CHR$(10) AND X<21 THE
N 800 ELSE 840
800 IF X<21 THEN 810 ELSE 820
810 SET(8,X,1):SET(9,X,1):SET(8,
(X+1),1):SET(9,(X+1),1):X=X+2
820 W=W+1:TT=TT-1:IF X>20 THEN X
=20
830 IF W>TT THEN PRINT@(32),N$:P
RINT@(384),"":PRINT:PRINT:PRINT:
PRINT@(425),"POSSITION
            THEN PRESS <ENTER>":S=
9:GOTO410
840 IF CC$=CHR$(13) THEN 860 ELS
E 850
850 NEXT DD:GOTO710
860 GOTO1280
870 CLS:PRINT@(198),"ACCOUNT NUM
BER":INPUT"              ";A(3,W
):CLS
```

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```
880 IF A(3,W)>B THEN 870
890 IF A(3,W)<1 OR A(3,W)>99 THE
N 870
900 CLS
910 PRINT @(198),"AMOUNT OF CHEC
K":INPUT"          ";A(5,W)
:CLS
920 SOUND225,2
930 IF A(5,W)<1 OR  A(5,W)>9999.
99 THEN 910
940 A(6,W)=A(6,(W-1))-A(5,W)
950 GOTO 340
960 CLS:SOUND225,2:IF A(6,W)<0 T
HEN CLS4 :SOUND 100,10
970 CLS
980 P=0:T=0:R=0:D=0
990 PRINT @(2),
 "PERIOD          "A(1,1)"THRU"A(1
,W);
1000 PRINT@(34),
 "CHECKS          "A(2,1)"THRU"A(
2,W);
1010 FOR Q=1TOW'REM TOTALS DEP
1020 P=P+A(4,Q)
1030 NEXT Q
1040 PRINT @(66),
 "TOTAL DEPOSITS     =    "
1050 IF P<1000.00 THEN PRINT @(8
8),USING"####.##";P ELSE PRINT @
(87),USING"#####.##";P
1060 FOR Q=1TOW
1070 T=T+A(5,Q)
1080 NEXT Q
1090 PRINT@(98),
 "TOTAL CHECKS       =    "
1100 IF T<1000.00 THEN PRINT @(1
20),USING"####.##";T ELSE PRINT
@(119),USING"#####.##";T
1110 FOR N=1TOB:R=0:Q=0
1120 FOR Q=1TOW
1130 IF A(3,Q)=N THEN R=R+A(5,Q)

1140 NEXT Q
1150 IF R>0 THEN D=D+1
1160 IF D>7 THEN 1170 ELSE 1200
1170 IF D=8 THEN PRINT@(418),"TO
 CONTINUE PRESS <ENTER>"
1180 BB$=INKEY$:IF BB$=CHR$(13)
THEN 1190 ELSE 1180
1190 D=1
1200 IF R>0 THEN PRINT @(98+(D*3
2)),USING"##";N
1210 IF R>0 THEN PRINT @(101+(D*
32)),F$(N)
1220 IF R>0 THEN PRINT @(116+(D*
32)),"="
1230 IF R>0 THEN PRINT @(119+(D*
32)),USING"#####.##";R
1240 NEXT N
1250 PRINT:PRINT:PRINT:PRINT:PRI
```

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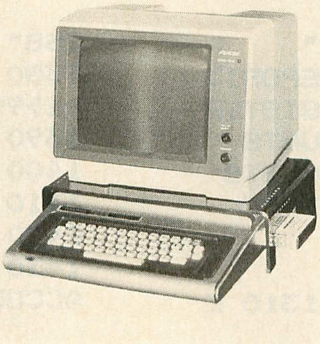
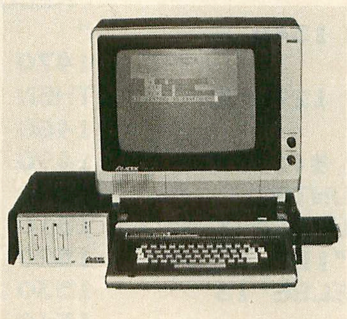
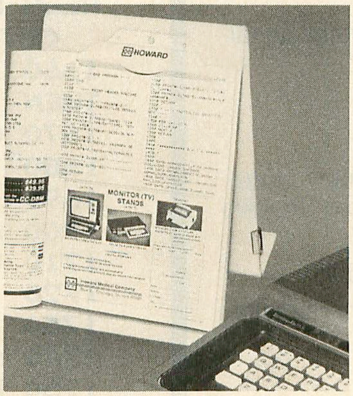


TS-1 & 300A



TS-5, C-1 & DD-3

TS-4



MH-1

MONITORS

300A $177	12" amber screen. High resolution 18MHz bandwidth. Extra speaker needed for sound. (Amdek)
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```
NT
1260 PRINT@(418),"TO CONTINUE PR
ESS <ENTER>"
1270 L$=INKEY$:IF L$=CHR$(13) TH
EN 1280 ELSE 1260
1280 CLS:PRINT@(143),"MENU"
1281 PRINT@(194),"CHECKS/DEPOSIT
S PRESS <ENTER>   PRINT REGISTER
  PRESS    <1>    ADD ACCOUNTS
  PRESS    <2>    LIST ACCOUNTS
  PRESS    <3>    SAVE ON TAPE
  PRESS    <4>"
1290 Z$=INKEY$
1300 IF Z$<>CHR$(52) THEN 1310 E
LSE 1460
1310 IF Z$<>CHR$(51) THEN 1320 E
LSE 970
1320 IF Z$<>CHR$(13) THEN 1330 E
LSE 290
1330 IF Z$<>CHR$(49) THEN 1340 E
LSE 340
1340 IF Z$<>CHR$(50) THEN 1290 E
LSE 1350
1350 E=0:CLS:Y=99-B:PRINT @(198)
,         "YOU HAVE"(Y)"ACCOUNTS.
           HOW MANY ARE REQUIRED":
PRINT:INPUT"                 ";E
1360 IF B+E>99 THEN 1370 ELSE 13
90
1370 CLS:PRINT:PRINT:PRINT @(68)
,        "YOU AND I BOTH KNOW THAT
          YOU DON'T NEED ANY WHERE
          NEAR THAT MANY ACCOUNTS.
          COME BACK TO REALITY AND
          SELECT" (Y) "ACCOUNTS OR L
ESS"
1380 INPUT"                  ";E:IF B
+E>99 THEN 1370 ELSE 1390
1390 IF B+E>99 THEN 1370
1400 CLS:H=B+1
1410 GOSUB 1420:W=W+1:GOTO170
1420 FOR C=H TO (B+E)
1430 PRINT @(193),"TYPE NAME OF
ACCOUNT NUMBER";C:PRINT:INPUT"
        ";F$(C)
1440 CLS
1450 NEXT C:CLS:B=(B+E):GOTO1280
1460 PRINT@(389),"PRESS PLAY AND
 RECORD                  <ENTER>
"
1470 EE$=INKEY$:IF EE$=CHR$(13)
THEN 1480 ELSE 1470
1480 CLS:G=W
1490 OPEN "O",#-1,"CHECKS"
1500 PRINT #-1,G
1510 PRINT #-1,H,B,E
1520 FOR S=1 TO G
1530 FOR V=1 TO 6
1540 PRINT#-1,A(V,S)
1550 NEXT V
1560 NEXT S
1570 FOR C=H TO (B+E)
1580 PRINT #-1,F$(C)
1590 NEXT C
1600 CLOSE #-1
1610 GOTO 1280
1620 NEXT S
1630 CLOSE#-1
1640 GOTO1280
1650 CLS:PRINT@(192),"  TO REVIE
W PRIOR MONTH REWIND    TAPE DEP
RESS PLAY BUTTON AND
  <ENTER>"
1660 ZZ$=INKEY$:IF ZZ$=CHR$(13)
THEN 1670 ELSE 1660
1670 OPEN "I",#-1,"CHECKS"
1680 INPUT #-1,G
1690 INPUT #-1,H,B,E
1700 FOR S=1 TO G
1710 FOR V=1 TO 6
1720 INPUT #-1,A(V,S)
1730 IF EOF(-1) THEN 1800
1740 NEXT V
1750 NEXT S
1760 FOR C=H TO (B+E)
1770 INPUT #-1,F$(C)
1780 NEXT C
1790 IF EOF(-1) THEN 1800
1800 CLOSE #-1:W=W+G:GOTO340
```

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SOURCE GENERATOR: This package is a disassembler which runs on the Color Computer and generates your own source listing of the BASIC interpreter ROM. Also included is a documentation package which gives useful ROM entry points, complete memory map, I/O hardware details and more. A 16K system is required for the use of this cassette. **80C Disassembler: $49.95**

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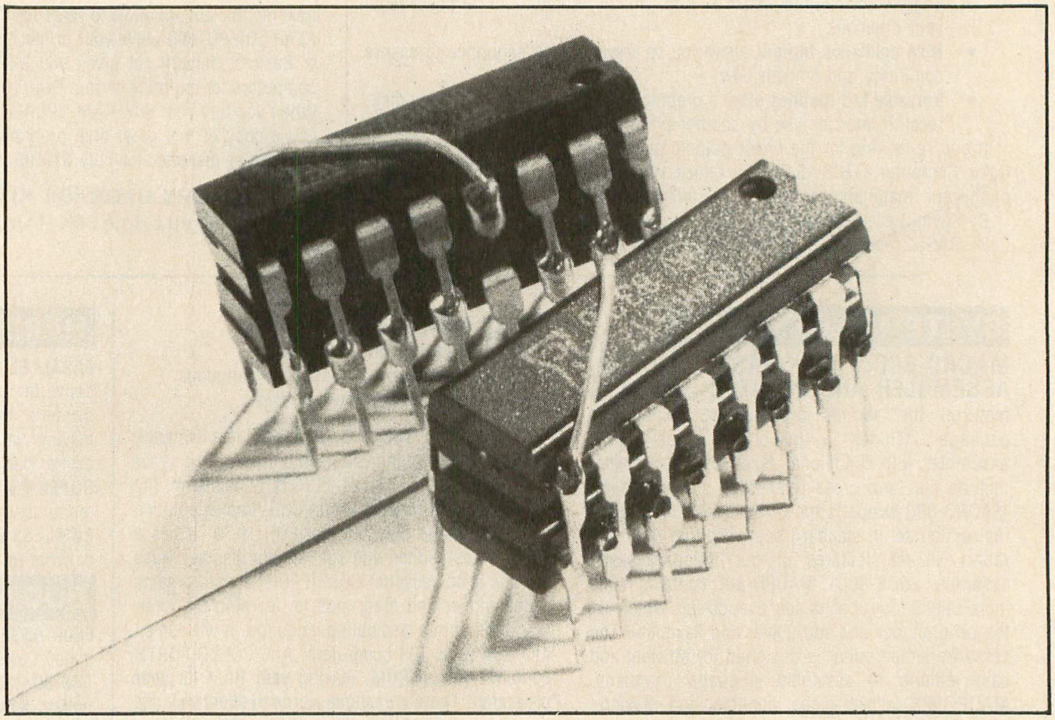

By Tony DiStefano
Rainbow
Contributing Editor

A long, long, long, long, long time ago Radio Shack introduced a little gem called the Color Computer. It had a whopping 4K RAM memory. The first thing you knew, the hobbyists were able to expand this computer's memory to 16K, probably even before Radio Shack introduced its 16K. Then the hobbyists boosted the memory to 32K by a method known as piggyback, again before Radio Shack. The hobbyists didn't stop there, 64K memory was next. But the 64K memory did not consist of piggybacking four sets of 16K chips, it was a different chip. All of the 32K piggyback chips were put on the shelf or put in computers whose owners did not care for 64K. Where am I leading with all this, you may ask? Well, a few months ago Radio Shack released another little gem, the Color Computer 2. Only this time they started with 16K memory and after looking inside one, I saw that it was very easy to upgrade to 64K. Most of the owners will be upgrading to 64K. This is part one of this month's article: How to upgrade from 16K to 64K memory in the Color Computer 2. To upgrade your Color Computer 2 to 64K, you must first get a Color Computer 2. Ha ha, only kidding, but you will need some 64K memory chips. The chips to get are #4164, with an access time of 300ns or faster. There are many different suppliers for this chip, with many different numbers, but as long as they are 4164 compatible they will do.

(Tony DiStefano is well known as an early specialist in Color Computer hardware projects. He is one of the acknowledged experts on the "insides" of CoCo.)

Open the CC-2 by removing all of the screws on the bottom. Remove the top cover. Carefully remove the keyboard by pulling the ribbon wire out by the dark colored base. The eight identical chips along the bottom of the PCB are the old 16K chips. Using an IC extractor or a small flat screwdriver, remove the eight chips. Put them aside for now. Insert the 4164 chips. Make sure that pin one on the chip goes in pin one in the socket. The only other thing you have to do is to make one solder joint. Look for a small "W1" in between the 6822 PIA and the SN74LS244 chip. Right above this W1 mark are two solder points. Solder these two points together and *voila,* 64K memory. That's all there is to it! Now, if a whole lot of people convert to 64K, that will leave a lot of 16K chips sitting around doing nothing.

This will be the second part of this month's article. Those 16K chips that are removed from the Color Computer 2 to make 64K can be used to give you 32K. Yes, it will be in the piggyback fashion. It is a little harder to do than a 64K upgrade, but nevertheless can be done in less than one hour. To upgrade a 16K Color Computer 2 to 32K you will need either a set of 16K chips removed from another Color Computer 2 or buy a set of 16K chips. One important note to remember is these chips are not ordinary 16K chips. They are not the same chips that come from the regular Color Computer. The chips that come from the first CoCo are 4116 chips. The 16K chips that go into the Color Computer 2 are 2118 chips. The main difference between a 4116 and a 2118 chip is that the older type 4116 needs three power supplies to run. It needs +5 volts, +12 volts and -5 volts. The newer 2118 needs only +5 volts to run. It is also more power efficient.

If you piggyback 4116 chips in the CC-2, it will not work, and might even do some damage, so don't put 4116 memory chips in the CC-2. Now that the warning has been said, it's time to continue. Remove the eight memory chips from the board. You should now have 16 memory chips, eight from your computer and eight from another source. Put half of them aside for now. Examine one of the chips carefully, notice the pins. When a pin comes out of the chip it is wide, then it becomes narrow. The narrow part of the pin is the part that goes into the socket. With a narrow pair of long-nose pliers (or a finger, if you have narrow fingers) grab the narrow part of pin 4. Bend the pin back and forth until it falls off. Be careful that you don't bend the wide part of the pin. That part of the pin should stay intact. Do this to seven more chips to give you a total of eight chips with the narrow part of pin 4 removed. Next take out the untouched chips. Mount the chips with the short pin on top of the chips with all the pins. The photo will help you determine how to position the chip. This photo was taken with a mirror, so that you can see both sides of the chip (there is only one chip in the photo). Before you start soldering, make sure that pin 1 on the top chip is on top of pin one on the bottom chip. Leave a small gap in between the top and bottom chip. This is needed for ventilation. Next, solder all the pins together. All but pin 4 of course, it is now to short to reach anyway. Okay, now get a small piece of wire. Any thin wire will do, I used some Radio Shack wirewrap wire. Cut eight pieces about ½" long. Strip off about $^{1}/_{32}$" of insulation off each end of each wire. Solder one end of this wire to pin 4 (the one with the short leg) of the chip-pak and the other end to pin 9 (still on the top) on the chip. Do this to all eight chip-paks. After you are finished clean the chip-paks carefully with a resin remover. Radio Shack now carries resin remover. The part number is 64-2322. It is not of the best quality, but is good for small jobs like the chip-paks. After the chip-paks are clean, check them over for shorts or cold solder joints and repair them. When you are sure that they are all okay, plug the paks into main board. Again, make sure that pin one on the chip goes into pin one in the socket. When you are finished, turn the computer on and type in:

```
PRINT MEM [ENTER]
```

Without a disk drive plugged it, the amount of memory displayed should be 24871. With a drive plugged in, the value should be 22823. And finally without Extended BASIC it should be 31015. If you get these values, all is okay and you can close up your CC-2. That's all there is to do to upgrade a CC-2 from 16K to 32K. If you have problems, chances are that you soldered one of the chips in backwards. In that case you might as well throw the two chips away and start again. Well, that's all for this month.

I hope you have lots of good memories.

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Nostalgia, Notes And Tools Of The Trade

By Dale L. Puckett
RAINBOW Contributing Editor

Even Scrooge must get nostalgic this time of year. A new program or two under the Christmas tree—maybe you'll even get your first look at OS-9 that way—is bound to put you in the mood. Besides, as a CoCo owner you have every right to be nostalgic as you wind up 1983 and move into the new year. You now own one of the best operating systems on a microcomputer today.

I must confess, I got a head start on you. Just when I was preparing to write this month's column,—it's October 30—Richard Don, the infamous vice president at GIMIX, called. He was excited because several large companies had just bought one of his GIMIX III systems with one million bytes of RAM memory and 47 million bytes of online storage on a hard disk. Neither one of us could believe it. Little more than five years ago we had both started in this business with micros that had barely 4,000 bytes of RAM memory and no online storage. The sea stories started.

It reminded me of the first six months I owned my SWTPC computer. I didn't have a teletype machine with a paper tape reader and cassette tape storage hadn't been invented for micros yet, so I left the computer turned on for several weeks at a time. After all, it took three or four hours to type in two or three thousand bytes of hex object code by hand—just to play tic-tac-toe. There's nothing that can

```
PROCEDURE Boldface
 0000
 0001       DIM in:STRING[50]
 000D       DIM char:STRING[1]
 0019
 001A       PRINT "Type string you would like to see boldface? ";
 004B       in="" \a=0
 005A
 005B       WHILE char<>CHR$(13) DO
 0068         GET #0,char
 0071         in=in+char \a=a+1
 0089       ENDWHILE
 008D
 008E       PRINT
 0090       PRINT CHR$($1B)+CHR$($51)
 009B       PRINT "This is the boldface string ";
 00BC       PRINT in;
 00C2       FOR i=1 TO a \ PRINT CHR$(8);  \NEXT i
 00E5       PRINT CHR$($1B)+CHR$($49); in;
 00F5       PRINT ", did you like it?"
 010B       PRINT
 010D       PRINT CHR$($1B)+CHR$($71)
 0118       END
 011A
```

(Dale L. Puckett is a freelance writer and programmer who has worked with the Motorola family of miroprocessors since 1976. He just completed his first book, "A Complete Tour Guide to BAISC09,*" this summer. It is being published by Microware and will be available this fall. He is the author of DynaSpell, Readtest, Esther and Help, which are available from Frank Hogg Laboratories. He serves on the Info World Software Review Board and is a Chief Warrant Officer in the U.S. Coast Guard.)*

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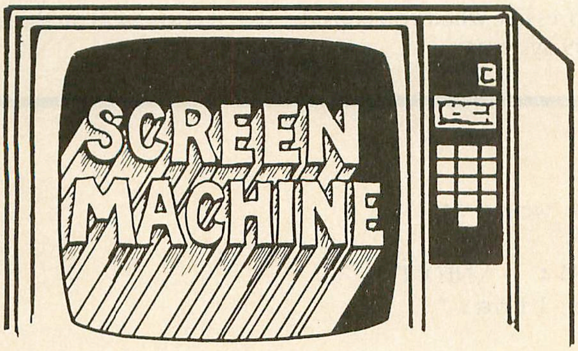

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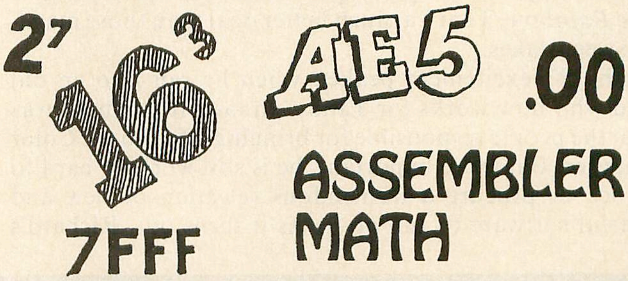

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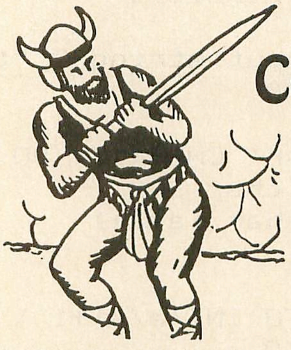

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Which brings me to some good news. Richard went out to the RAINBOWfest in Fort Worth to see what this CoCo OS-9 thing was all about. When he returned to Chicago, he was bursting with enthusiasm. In fact, he was so excited when I talked to him that he was thinking about offering a GIMIX III system as a grand prize for an OS-9 contest here at *the Rainbow*. That's a much better deal than those magazine sweepstakes.

Richard's excitement peaked when he ran into an old friend who now works for Tandy. In fact, it seems he was one of the people responsible for bringing OS-9 to the Color Computer. But more important, he is still working hard to produce or procure a tremendous selection of new and powerful software to run on it. As it turns out, Richard's friend is also a pioneer and has been working with Motorola's 6800 chips as long as they have been manufactured.

In Richard's words, "He came up through the ranks . . he's not a Z-80 retread. You couldn't find a more scrupulous person in this business. If a piece of software is good this guy will recognize it. Great things are going to happen to CoCo OS-9."

I asked him if he heard anything specific and got some great news. A CoCo OS-9 version of Microware's "C" compiler—one of the best on any microcomputer—is in production now. In fact, it will probably be on the shelf by the time you read this. Better yet, scuttlebutt has it that the price will be somewhere in the $100 price range. Very impressive when you consider that it costs $400 on the larger 6809 systems.

```
PROCEDURE Underline
 0000
 0001        PRINT "This is an underlined word";
 0020        PRINT CHR$($1B)+CHR$($51);
 002C        FOR i=1 TO 15 \ PRINT CHR$(8);  \NEXT i
 004F        PRINT "__________ ____  in a line."
 006E        PRINT CHR$($1B)+CHR$($71);
 007A        PRINT
 007C        END
 007E
PROCEDURE RisingLine
 0000
 0001        DIM char:STRING[1]
 000D        DIM a$:STRING[50]
 0019
 001A        PRINT "Input string ? ";
 002E        a$="" \a=0
 003D
 003E        WHILE char<>CHR$(13) DO
 004B          GET #0,char
 0054          a$=a$+char \a=a+1
 006C        ENDWHILE
 0070
 0071        FOR i=1 TO INT(a/4)+1 \ PRINT  \NEXT i
 0099        FOR i=1 TO a
 00AB          PRINT MID$(a$,i,1); CHR$($1B)+CHR$($4B);
 00C2        NEXT i
 00CD        FOR i=1 TO INT(a/4)+1 \ PRINT  \NEXT i
 00F5        END
 00F7
PROCEDURE CharacterSets
 0000
 0001        DIM a$:STRING[80]
 000D        DIM c$:STRING[1]
 0019
 001A        b$:=CHR$($1B)+CHR$($4A)
 0028        c$:=CHR$($0D)
 0031
 0032        PRINT b$+"StdCS"
 003F        PRINT "This is an example of the standard character"
 006F        PRINT "set. It is easy to change to ";
 0091        PRINT b$+"Std64";
 009F        PUT #1,c$
```

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OS-09 Users Group News

Here's an interesting note I pulled off our OS-9 Users Group Bulletin Board (312-397-8308—Type a Carriage Return and Line Feed, then answer the prompt with "HELG500,,3[ENTER]" to get on line.): "The activity on the CoCo SIG on CompuServe with respect to OS-9 is really picking up. There are many technical messages, queries, observations, and complaints by users with every level of sophistication. It won't be long until we see some neat things from that group."

From the tone of that note, you can see that Users Group members are anxiously awaiting an active participation from CoCo OS-9 Users. In fact we are talking about putting a CoCo Help menu on our Bulletin Board. We'll let you know here when it is on the air.

Frank Hogg has offered to distribute our Users Group software. This means our members will be able to get utilities and programs from our software exchange library for only $3. In fact, each new member will receive one disk of software FREE when he/she joins the Users Group. The first disk should be available by December 1.

Our membership fee is $25. For information about our group and a sample copy of our newsletter, send a note to us at our new address:

OS-9 Users Group
Post Office Box 8027
Des Moines, IA 50301

The Toolbox Philosophy

Since OS-9 is modeled after the UNIX system, it's only fitting that we should learn to think of individual programs and utilities as tools. We can run more than one process very easily with OS-9 and that's half the battle. Now, all we have to do is figure out how to use several of our small programs together to do a big job.

Let's begin with a few examples. When I first ran OS-9, I did everything the hard way. I typed out every pathlist. I just didn't trust the machine. I was as non-productive as you could be. One of my typical command lines might have looked like this:

```
OS-9:/d0/cmds/copy #16K /d0/cmds/greatbigprogram
  /d1/cmds/greatbigprogram
```

Talk about sore fingers!

Then, I learned about the default directories. Life was much simpler:

```
OS:9 chd /d0/cmds
OS:9 copy #16K program /d1/cmds/program
```

That was much better. But then every once in awhile, I found myself needing to copy a directory that contained 30 or 40 files. I used the "Control A" key a lot. This saved about half the typing, but it was still a hassle.

About six months later a utility called "dsave" was introduced. It was very useful for copying an entire directory—or even an entire disk. The commands went something like this:

```
OS9: chd /d1/directorytocopy
OS9: dsave /da >/d0/copy-procedure-file
OS9: chd /d0
OS9: /d0/copy-procedure-file
```

```
 00A8      PRINT "a different set. In"
 00BF      PRINT "this case we are running 64 by 19 set. It is also easy"
 00F9      PRINT "to have ";
 0106      PRINT b$+"Dwcs";
 0113      PUT #1,c$
 011C      PRINT "a Double Width Char-"
 0134      PRINT "acter set. However it "
 014E      PRINT "is ";
 0156      PRINT b$+"StdCS";
 0164      PUT #1,c$
 016D      PRINT "much easier to read the standard 51 by"
 0197      PRINT "24 Character set."
 01AC      PRINT
 01AE      END
 01B0
PROCEDURE Menu
 0000
 0001      SHELL "tmode -pause"
 0011
 0012      DIM char:STRING[1]
 001E      DIM choice:INTEGER
 0025
 0026      PRINT CHR$($0C) \ PRINT  \ PRINT
 0030
 0031      PRINT "1.. Rising Line test."
 004A      PRINT "2.. Boldface test."
 0060      PRINT "3.. Underline test."
 0077      PRINT "4.. Switch Character Sets."
 0095      PRINT "5.. Exit."
 00A2      PRINT
```

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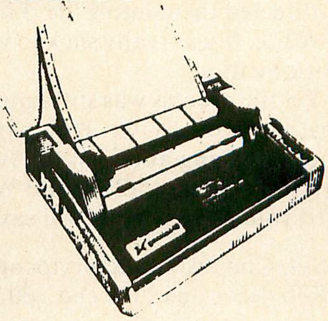

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When I ran this sequence the machine did most of the typing. Dsave generated a file with a series of lines that looked similar to the first example above. Since I always re-directed them into a file, I then needed to run this procedure file. It was really slick to watch the computer do all the work by itself.

Yet the process was still simpler when pipes became available a year or so later. How would you like to trade the four lines of typing above in for two command lines—and the first line doesn't really count! Write them on a label and stick it to your keyboard. It will save you hours.

```
OS-9: Chd /d1/directorytocopy
OS-9: dsave /da ! (-x chd /d0/directory-to-copy-to)
```

When you try this, you'll be using your first OS-9 "pipe." The magic is in the exclamation point—the symbol for an OS-9 pipe. Here's what happens when you run the command lines above.

The first line sets your current data directory to /d1/directorytocopy. Dsave always saves the current data directory.

In the second line we used a pipe, "!", instead of redirection, ">/d0/copy-procedure."

Since we didn't use redirection, OS-9's Shell would normally have sent the output of dsave to the standard output device. Remember, this is normally your CoCo screen or terminal. But, since you typed the pipe symbol after the dsave command, the Shell will pipeline the data straight into the command on the second half of the line.

In this case, the second half of the line tells the Shell not to abort on an error and to change the current data directory to /d0/directory-to-copy-to. After it does this, the Shell accepts the characters from dsave just as if they were coming from the keyboard. Each time the Shell finds a carriage return on the end of a line, it executes the commands on that line. When each of the lines generated by dsave has been executed, your new directory will be ready to run.

More About Pipes, Filters and Other Tools

Let's look at some more examples and introduce you to some new OS-9 tools. Microware released a package of utilities called "The OS-9 File Handler Tool Box" in August. I bought it while I was at the seminar and it seems that I am using it all the time.

Microware designed the package so that most of the utilities could be used as filters. In other words, they would read data from standard input device, modify it in some manner, and then send it to the standard output device. Additionally, several of the programs in the package can take a list of filenames from your keyboard and perform the desired operation on all of them.

The idea for this package came from the Addison-Wesley book *Software Tools* by Brian W. Kernighan and P. L Plaugher. All of them are popular on the UNIX operating system. The package includes:

Code	Display the hexadecimal equivalent of a key
Count	Character count, word count, line count
Compress	Compress a text file
D	Print directory listing
Expand	Expand a compressed file
Grep	Globally find Regular Expression and Print
PR	Print a file with formatting
QSORT	Quick in-memory sort
Space	Space and/or indent a file

```
00A4
00A5      LOOP
00A7        PRINT "      Your choice ";
00BE        INPUT choice
00C3      EXITIF choice=5 THEN GOTO 100
00D2      ENDEXIT
00D6        PRINT
00D8        WHILE choice>0 AND choice<6 DO
00EB
00EC          IF choice=1 THEN RUN RisingLine
00FB          ENDIF
00FD          IF choice=2 THEN RUN Boldface
010C          ENDIF
010E          IF choice=3 THEN RUN Underline
011D          ENDIF
011F          IF choice=4 THEN RUN CharacterSets
012E          ENDIF
0130
0131          PRINT "Type 'ENTER' to continue ?";
0150          GET #0,char
0159
015A        ENDWHILE
015E      ENDLOOP
0162
0163 100  SHELL "tmode pause"
0175      END
0177
```

Split	Split a file into pieces
TR	Transliterate file contents
Xmode	Examine or change device descriptor (This one is standard with CoCo OS-9)

Now, let's show you how you can use several of these small utilities on the same command line to do a big job.

For example, when your directories get long—they really shouldn't with OS-9's hierarchical directory system—it is a hassle to look through a list of filenames in random order. Life would be much easier if you could look at a sorted list. Try this command line:

```
d ! qsort ! pr >/p
```

Amazing, isn't it? Now, imagine that you would like to know how many "C" source files you have in a directory. Let's count them:

```
OS9: d *.c ! count -l
```

This command line should do the job if your "C" source files are in your current data directory.

Now imagine that you are an author and that you have just finished writing another chapter in the great American novel. You have full confidence in your abilities as a writer but you realize you have this bad habit: you keep using tacky words. Instead of writing "use," you write "utilize" by force of habit. This time, you remember the problem and want to make a quick check to make sure you didn't slip up. Try this:

```
OS9: grep utilize Great.American.Novel.Chapt4 ! count -l
```

In a few seconds you'll know how many times you used the word utilize. Slick, huh? By now you can see that with a full toolbox you can find out just about anything you want to know by using the proper OS-9 command line.

Here's some better news. There are a lot of good UNIX textbooks out, several UNIX journals and a number of articles in the trade press about this operating system. All of these books and articles give good examples that show you how to exercise the UNIX toolbox for all it's worth.

Harry Fair, a consultant out in Denver, has approached Frank Hogg Labs with a proposal to release an OS-9 toolbox that is UNIX compatible. All of the utilities will have UNIX names and their command line syntax will be just like the same utility on the UNIX system. I saw the proposal this month and it's a tremendous step in the right direction. In fact, I'm running the first 15 utilites in my OS-9 toolbox now and they are great.

SOME MORE BASIC OS-9 DEMOS

Last month we told you a lot about the Hi-Res screen in the O-PAK release from FHL. At that time we promised to show you more this month. The BASIC OS-9 utilities accompanying this article exercise several of the capabilities built into Hi-Res. You'll see how to underline a word, boldface a word, or make a line run uphill. These sample precedures will give you another chance to study the structured programming techniques made possible by BASIC OS-9.

As we close, I extend my best wishes to you and your families for the happiest of holiday seasons as well as an exciting and prosperous New Year.

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Try This Helpful Number-Base Conversion Quiz

By Gary and Susan Davis

When my husband first bought his Color Computer almost three years ago, I was faced with the newest dilemma of our marriage: Should I try to learn to use the blankety-blank thing or should I become a computer widow instead?

Computer widowhood did not suit me at all, so I set up my plan of attack. I carefully went through the book "Getting Started with Color BASIC" and I enrolled in my first computer course at Ohio State University. So far, so good. The BASIC seemed like English and the introductory course at OSU was in FORTRAN.

The trouble started the next quarter when I enrolled in the next course at OSU. This time the language was COBOL and the assignments were much harder.

The fact that there were different computer languages was not a problem for me. I was a linguistics major in college and have varying degrees of knowledge of English, Spanish, French, Italian, Yiddish and Hebrew.

However, I found out that there are also different numbering systems involved in programming. This was bad news for someone who has for years resisted learning the metric system.

The teacher wanted us to take decimal numbers (the normal, regular, everyday numbers that you count with) and convert them to *hexadecimal* and *binary*!

Once I understood that the "1"s and "0"s of the binary system are treated like on or off switches by the computer, I felt more comfortable with it. Hex will always seem unnatural to me.

Gary wrote this program to help me learn to convert any decimal, hexadecimal or binary number to one of the other number bases. With practice, I was able to answer most of the questions correctly most of the time. Facility in all three number bases will help you program in both BASIC and machine language.

The computer will randomly pick a number between 0 and 255 (decimal) for you to convert. It will also choose one of the three number bases into which you will need to convert the original number. You get up to three chances to correctly answer (guess) the question. If you haven't the faintest idea what's going on, strike the question-mark key and [ENTER].

There are 10 random problems in each quiz. When you are done, the computer will tell you how many you have answered correctly on the first try, how many you have answered correctly after a retry and how many were beyond you completely.

I hope you will find this number base quiz as helpful as I did.

(Gary and Susan Davis are co-owners of Sugar Software in Reynoldsburg, Ohio. Susan is a novice and Gary has been professionally programming for nearly 20 years.)

140..... 0109
300..... 0237
480..... 03F5
END ...05EB

The listing:

```
10 '       Number  Base
20 '
30 '        Conversion
40 '
50 '           Quiz
60 '
70 ' (C) 1982 By Sugar Software
80 '   Written by Gary Davis
90 '       2153 Leah Lane
100 ' Reynoldsburg, Ohio  43068
110 '      (614) 861-0565
120 '
130 FOR I=1 TO 10
140 CLS4
150 PRINT TAB(8);"PROBLEM NUMBER
";I:PRINT
160 PRINT TAB(11);"WHAT IS...":P
RINT
170 FROM=RND(3)
180 TO=FROM+RND(2)
190 IF TO>3 THEN TO=TO-3
200 NUMBER=RND(256)-1
210 ON FROM GOSUB 470,500,530
220 ON TO GOSUB 570,610,650
230 FOR J=1 TO 3
240 PRINT N1$;" IN ";N2$
250 INPUT A$
260 IF A$=ANSWER$ GOTO 360
270 IF A$="?" GOTO 310
280 PRINT "wrong"
290 SOUND 5,2
300 NEXT J
```

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```
310 PRINT @448," THE CORRECT ANS
WER IS ";ANSWER$
320 W2RONG=W2RONG+1
330 PRINT @484,"HIT enter TO CON
TINUE";
340 IF INKEY$="" GOTO 340
350 GOTO 400
360 IF J=1 THEN RIGHT=RIGHT+1 EL
SE PRIGHT=PRIGHT+1
370 PRINT "VERY GOOD!"
380 FOR K=1 TO 500:NEXT
390 SOUND 150,1:SOUND 250,1:SOUN
D 200,1
400 NEXT I
410 CLS5
420 PRINT "NUMBER COMPLETELY RIG
HT:  ";RIGHT
430 PRINT "NUMBER RIGHT AFTER RE
TRY:  ";PRIGHT
440 PRINT "NUMBER COMPLETELY WRO
NG:  ";W2RONG
450 END
460 ' From Decimal
470 N1$=STR$(NUMBER)+" (DECIMAL)
"
480 RETURN
490 ' From Hex
500 N1$=RIGHT$("0"+HEX$(NUMBER),
2)+" (HEX)"
510 RETURN
520 ' From Binary
530 GOSUB 710
540 N1$=N$+" (BINARY)"
550 RETURN
560 ' To Decimal
570 N2$="DECIMAL"
580 ANSWER$=MID$(STR$(NUMBER),2)
590 RETURN
600 ' To Hex
610 N2$="HEX"
620 ANSWER$=RIGHT$("0"+HEX$(NUMB
ER),2)
630 RETURN
640 ' To Binary
650 N2$="BINARY"
660 GOSUB 710
670 ANSWER$=N$
680 RETURN
690 ' Convert "NUM
BER"
700 'to binary and return
710 'string in N$
720 N$=""
730 N=NUMBER
740 FOR K=1 TO 8
750 BIT=N AND 1
760 N$=RIGHT$(STR$(BIT),1)+N$
770 N=INT(N/2)
780 NEXT K
790 RETURN
```

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PRINTER GRAPHICS

16K ECB

Printer Mystery

By Michael J. Himowitz and Julius Nelson

This is the third installment in a continuing series of short 'Printer Mysteries' which began in November.

Here's a little January printer mystery for those of you who have the *Printer Artist* program from the November issue of *the Rainbow*. To use it, *RUN* the program and enter the characters below, line by line. For example, 6X means strike the "X" key six times; 24sp means strike the space bar 24 times. Consult the instructions in the November issue. We won't tell you what this one is, because that would spoil the fun. The only clue is that you're more likely to see this fellow in Minnesota than in Florida.

For those interested in sophisticated printer art development, a complete "Printer Artist" system is available from Federal Hill Software, 825 William St., Baltimore, Md., 21230.

LINE
1 31sp 6X
2 31sp 5X
3 30sp 5X 20sp 1X 2sp 1X 2sp 1X
4 30sp 5X 19sp 1X 2sp 1X 2sp 1X 2X 1x
5 17sp 2X 11sp 4X 18sp 2X 2sp 1X 2sp 1X 2sp 1X
6 16sp 3X 11sp 3X 17sp 7X 1sp 1X 2sp 1X
7 15sp 5X 10sp 3X 14sp 11X 1sp 2X
8 13sp 7X 4sp 2X 4sp 2X 12sp 15X
9 11sp 10X 3sp 3X 3sp 3X 7sp 15X
10 9sp 13X 1sp 27X
11 8sp 24X 5sp 8X
12 7sp 24X
13 8sp 23X
14 8sp 21X
15 9sp 18X
16 13sp 20X
17 14sp 3X 2sp 17X
18 19sp 19X
19 19sp 19X
20 19sp 19X
21 17sp 22X
22 16sp 25X
23 15sp 9X 1sp 17X
24 14sp 8X 4sp 16X
25 13sp 5X 9sp 16X
26 12sp 5X 6sp 21X
27 11sp 5X 4sp 27X
28 10sp 5X 4sp 31X
29 10sp 4X 4sp 15X 3sp 16X
30 10sp 3X 5sp 11X 8sp 17X
31 18sp 8X 18sp 14X
32 18sp 8X 18sp 14X
33 17sp 8X 22sp 11X
34 16sp 9X 24sp 11X
35 16sp 9X 28sp 9X 3sp 2X
36 17sp 7X 29sp 13X
37 17sp 6X 31sp 5X 3sp 2X
38 16sp 7X 30sp 9X
39 14sp 8X 32sp 2X 2sp 2X
40 12sp 11X 31sp 1X 1sp 2X
41 8sp 1X 1sp 2X 4sp 1X 5sp 1X 31sp 2X
42 9sp 5X 2sp 1X 6sp 3X 26sp 3X
43 9sp 18X
44 12X 2sp 15X 2sp 15X 2sp 14X 2sp 11X

(Mike Himowitz is a Washington correspondent for the Baltimore Evening Sun and proprietor of Federal Hill Software. Julius Nelson is an educator, author of many typing textbooks and creator of the craft known as "Artyping.")

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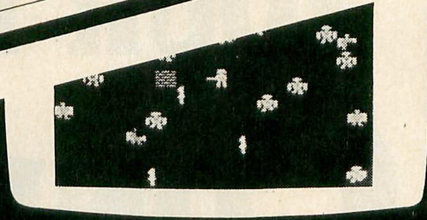

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By Jorge Mir

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You can now save programs to cassette with a lot more confidence. This is what *Protect* was mainly designed to do!

Protect is a short BASIC subroutine to be added to programs you are developing (or to any program for that matter) in order to protect them from being "erased." I placed the word erased in quotes because your computer does not really erase any BASIC program, it just changes the pointers telling the computer where the program starts and ends and where the first step is.

Append the *Protect* subroutine at the end of your program. Have the first step in your program indicate a "GOSUB 9000" statement to the subroutine and from then on you will have the program protected.

IMPORTANT: Any time you add, delete or edit steps to your program, *RUN* it again to make sure the *Protect* subroutine keeps track of the new BASIC pointers.

The *Protect* subroutine actually creates a short machine language program which, when executed, will reset the BASIC pointers so you can get back into the program. For example, you can actually type NEW [ENTER] which wipes out your program without losing it at all! All you have to do is type EXEC[ENTER] and presto you are back into your program.

There is a *CSAVE* subroutine within *Protect* which will allow you to save programs to cassette and immediately reload them to make sure they were correctly copied. When you are ready to make a cassette copy of your program, just type GOTO 10000. The program will then ask for the filename under which your program will be saved. It will save it to cassette and will then ask you to reload it immediately to check it out.

If you encounter an I/O Error when loading the copy, don't worry. All you have to do is type EXEC [ENTER] and you are back into the original program which you can try to save again. It is just that simple!

If for some reason the BASIC pointers are accidentally changed by either typing NEW or *POKEing* erroneously into the pointer locations in RAM, just follow the same procedure to recover the program.

(Jorge Mir is a certified public accountant and is currently controller of a "Fortune 500" company. He publishes most of his original work on the CoCo through ***the Rainbow.****)*

In some cases, you may not be able to follow this procedure to make sure your program has been copied correctly. For example, if your program is quite long, you might run out of memory when you are reloading the copy. What actually happens is that both programs (the original one plus the reloaded copy) must reside in memory. If both of them cannot fit in memory, you will get an O/M Error. If that is the case, there is only one thing to do: Make several copies to make sure you get a good one!

Protect will give you that added peace of mind against those monstrous words: "I/O Error."

9060 . . . . 01B5
10020 . . . 026D
END 0376

```
1 GOSUB9000
2 ' ***************************
3 '
4 ' TYPE YOUR PROGRAMS BETWEEN
5 ' STEPS 10 AND 8999.
6 ' TO CSAVE, JUST TYPE:
7 '   GOTO 10000 <ENTER>
8 '
9 ' ***************************
8999 END
9000 '** PROTECT SUBROUTINE **
9010 '**   BY:  JORGE MIR    **
9020 B=PEEK(25)*256+PEEK(26)
9030 P=&H200
9040 POKE&H9D,2:POKE&H9E,0:Y=0
9050 Y=0:FOR X=1TO38STEP2
9060 POKEP+Y,VAL("&H"+MID$("8E00
009F198E00009F1B8E0000BF00007EAE
75",X,2)):Y=Y+1:NEXTX
9070 POKEP+1,PEEK(25):POKEP+2,PE
EK(26):POKEP+6,PEEK(27):POKEP+7,
PEEK(28)
9080 POKEP+11,PEEK(B):POKEP+12,P
EEK(B+1)
9090 POKEP+14,PEEK(25):POKEP+15,
PEEK(26)
9100 RETURN
10000 '** CSAVE SUBROUTINE **
10010 GOSUB 9000
10020 CLS:INPUT"PROGRAM NAME";I$
10030 CSAVE I$
10040 CLS:PRINT:PRINT"O.K., PROG
RAM IS NOW SAVED."
10050 PRINT:PRINT"REWIND TAPE AN
D 'CLOAD' IT AT   THIS TIME."
10060 PRINT:PRINT"IF YOU GET AN
'I/O ERROR', THEN TYPE 'EXEC', P
RESS <ENTER> AND  SAVE THE PROGR
AM AGAIN.":PRINT:PRINT
10070 POKE25,PEEK(27):POKE26,PEE
K(28):NEW
10080 POKEP+14,PEEK(25):POKEP+15
,PEEK(26)
10090 RETURN
```

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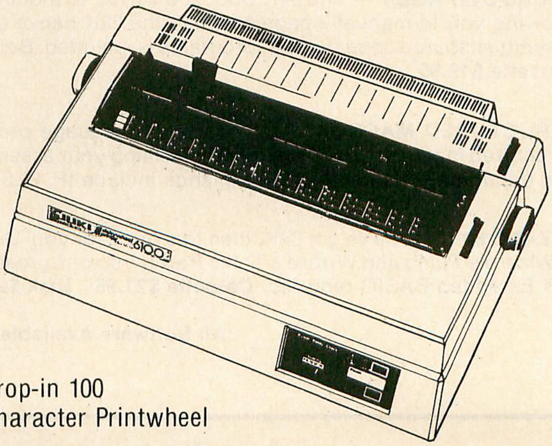

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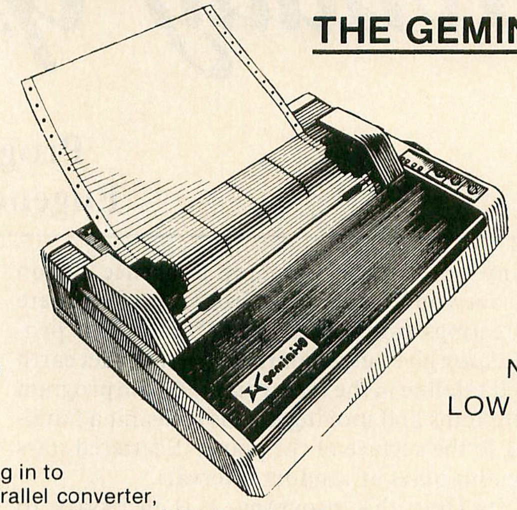

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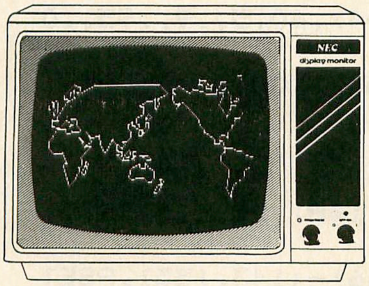

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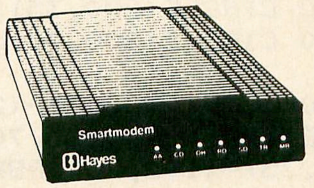

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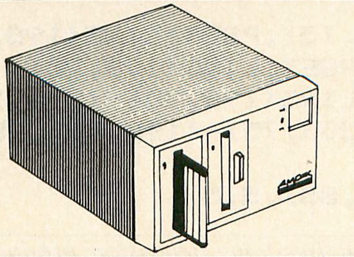

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Holiday Greetings 2

Program by
Eugene Vasconi

How many times while watching a science fiction movie have you heard a voice from out of nowhere say "Greetings from outer space!" Well, this program entited *Holiday* gives us a painting of our planet earth with an animated satellite in the foreground. As the program runs, the satellite spins and moving beams transmit a familiar holiday song to the surface of the planet. Scattered stars twinkle as the audio plays at random intervals.

Prior to *CLOADing* this program, it is necessary to *PCLEAR8*, and the length of the program dictates that nothing is added or an OM Error will occur.

With the space age (and the computer age) upon us, you will enjoy both watching and listening to this little "Holiday" animation.

—Noreen Morrison

The listing:

```
200..... 0255
520..... 04F0
END ... 0790
```

```
10 CLEAR75:GOTO680
20 PMODE3,1:SCREEN1,1
30 PCLS(3):COLOR5,3
40 CIRCLE(0,196),175,5,.75,.75,.
5
50 PAINT(25,150),2,5
60 CIRCLE(200,35),20,5,.25
70 CIRCLE(200,70),20,5,.25,.0,.4
5
80 LINE(220,35)-(220,70),PSET:LI
NE(180,35)-(180,70),PSET:LINE(20
3,35)-(198,20),PSET,B
90 PAINT(190,35),5,5:PAINT(190,5
0),4,5
100 LINE-(180,15),PSET:LINE(198,
20)-(180,25),PSET:LINE(198,20)-(
216,25),PSET:LINE(198,20)-(216,1
5),PSET:LINE(203,75)-(198,90),PS
ET,B
110 PAINT(200,85),5,5
120 FORX=0TO40STEP10
130 LINE(180+X,90)-(180,97),PSET
,B:NEXTX
140 PAINT(185,94),1,5:PAINT(195,
94),2,5:PAINT(205,94),3,5:PAINT(
215,94),4,5
150 FORX=1TO20
160 R=RND(180):S=RND(60)
170 T=RND(70)+180:U=RND(90)+100
180 PSET(R,S,5):PSET(T,U,5)
190 NEXTX
200 CIRCLE(0,176),68,5,1.3,.75,.
9
210 CIRCLE(0,104),60,5,.9,.95,.0
8
220 CIRCLE(0,150),100,5,.8,.85,.
05
230 CIRCLE(110,180),22,5,1,.65,.
9
240 CIRCLE(115,148),20,5,1,.98,.
17
250 LINE(135,146)-(143,155),PSET
:LINE-(150,142),PSET
260 CIRCLE(96,168),62,5,.7,.92,.
05
270 LINE(155,180)-(168,168),PSET
280 PAINT(10,90),5,5
290 CIRCLE(15,195),20,5,1.7,.6,0
300 PAINT(15,190),5,5
320 FORX=60TO192:PSET(0,X,2):NEX
TX:FORX=0TO175:PSET(X,191,2):NEX
T
330 PMODE3,5
340 FORX=1TO4:Y=X+4
350 PCOPY X TO Y
360 NEXTX
370 PMODE3,1:COLOR5,3
380 FORX=10TO180STEP3
390 Y=INT(100-(X/6)):Z=INT(140-(
X/2.7))
400 PSET(X,Y,4):PSET(X,Z,4)
410 NEXTX
420 FORX=80TO180STEP3
```

(Eugene Vasconi, a free-lance television producer, holds a M.A. in telecommunications. A self-taught CoCoer for two years, he sees the computer as the art form of the future in both graphics and music. His activities in Dallas involve television production and aviation.)

```
430 A=INT(260-(X/.97))
440 PSET(X,A,4)
450 NEXTX
460 FORX=0TO30STEP10
470 LINE(190+X,38)-(180+X,73),PS
ET
480 NEXTX
490 FORX=1TO5
500 R=RND(180):S=RND(60):PSET(R,
S,4)
510 T=RND(75)+180:U=RND(90)+100:
PSET(T,U,4)
520 NEXTX
530 PMODE3,5:COLOR5,3
540 FORX=0TO20STEP10
550 SCREEN1,1
560 LINE(195+X,38)-(185+X,73),PS
ET
570 NEXTX
580 LINE(215,73)-(220,56),PSET
590 FORX=8TO178STEP3
600 Y=INT(100-(X/6)):Z=INT(140-(
X/2.7))
610 PSET(X,Y,4):PSET(X,Z,4)
620 NEXTX
630 FORX=78TO178STEP3
640 A=INT(260-(X/.97)):PSET(X,A,
4):NEXTX
650 FORX=1TO5
660 R=RND(180):S=RND(60):PSET(R,
S,4)
670 T=RND(75)+180:U=RND(90)+100:
PSET(T,U,4):NEXTX
675 GOTO700
680 DIMA$(63)
690 FORQ=1TO63:READA$(Q):NEXTQ
695 GOTO20
700 Q=0
710 FORX=1TO8STEP4
720 PMODE3,X:SCREEN1,1
730 IFQ=63THEN733ELSE747
733 FORAA=1TO20:NEXTAA
745 A=RND(100):IFA=12THEN Q=0ELS
E760
747 Q=Q+1
750 PLAY"L40;O5;XA$(Q);"
755 FORP=1TO10:NEXTP
760 NEXTX
770 GOTO710
780 DATA E,E,E,G,E,E,E,G,E,G,C,D
,E,E,E,E,F,F,F,F,F,E,E,E,E,D,D,E
,D,G,F,D,E,E,E,G,E,E,E,G,E,G,C,D
,E,E,E,E
790 DATA F,F,F,F,F,E,E,E,G,G,F,D
,C,C,C
```

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Prompted Graphics Program

By Don Inman

As you sit down at your Color Computer to enter what may turn out to be your favorite program, pause for a few moments for a little planning. Reflect upon the fact that you might want to save your program and use it again at some later date. When the time comes, will you remember what the program does and how to use it? Will you remember what values are to be entered for any variables that you may have used? Maybe you'll want to show your program off to someone else. Will they know what should be entered from the keyboard?

A well-documented program should not only have lots of meaningful REM statements that show up in a listing, but also lots of easy to read prompts and clear menus from which to make selections. I realize that most of my own programs do not measure up to this advice. However, I will promise to improve in this respect if you will also.

A typical example would be an Extended Color BASIC graphics program. There is a certain amount of detail work that must be done before the desired graphics can be displayed. The correct mode must be selected from a list of five: *PMODE 0, PMODE 1, PMODE 2, PMODE 3,* and *PMODE 4*. Each mode differs from the others in one or more of the following ways:

1) the number of pixels (the smallest graphic element),
2) the size of the pixels, and
3) the number of colors available. Table 1 shows the variations possible.

(Don Inman is the acknowledged master of microcomputer graphics and the author of a large number of books, including "TRS-80 Color Computer Graphics and Assembly Language Graphics for the TRS-80 Color Computer" with Kurt Inman.)

Table 1 — GRAPHIC MODES

PMODE	Row and Column Size	Number of Colors	Pixel Size
PMODE 4	256 by 192	2	□
PMODE 3	128 by 192	4	□□
PMODE 2	128 by 92	2	□□
PMODE 1	128 by 96	4	⊞
PMODE 0	128 by 96	2	⊞

Figure 1 — SCREEN NUMBERING

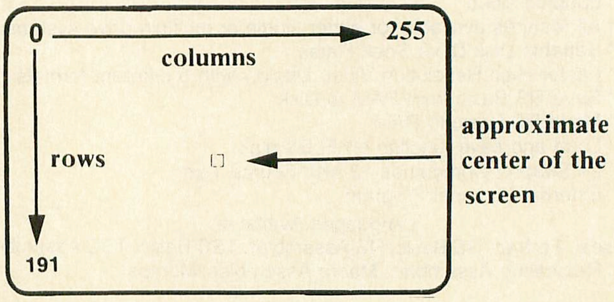
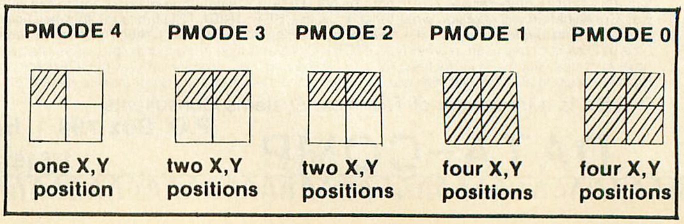


Figure 1 shows how graphic screen positions are numbered for all *PMODE*s. It also shows a pixel at the approximate center of the screen. Figure 2 shows the relative size and the X,Y positions occupied by one pixel (the shaded area) in each graphic mode.

Figure 2 — Pixel Size



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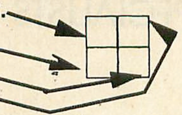

Since there is such a wide variety of options, it seems logical to allow for a choice each time a program is run. Otherwise, the program itself would have to be changed each time you want to change a value for a new run. We will start building a subroutine that can be saved for use with any graphic program that you might have. We can have the main program jump right to the subroutine which uses the text screen to prompt for the choices.

We know that the subroutine should let us choose the *PMODE* number. Then we can run the program with any *PMODE* we choose. The *INPUT* prompts should name the *INPUT* and give a range of acceptable *INPUT* values. The main program and the subroutine might start like this.

Main Program

```
100 REM * SAMPLE PROGRAM *
110 '
120 GOSUB 10000      ←——————  go choose the options
130 PMODE PN         ←——————  PN from line 10040
```

Subroutine

```
10000  REM  *  SUBROUTINE FOR
100010 REM      GRAPHIC OPTIONS  *
10020 ,
10030 CLS                    ←——————  clear the text screen
10040 INPUT  "PMODE NUMBER  0-4"PN  first input
```

After the *PMODE* (the variable PN) is selected, you will probably want to clear the graphics screen. Extended Color BASIC allows you to clear the graphics screen to any one of four background colors in a four-color mode (*PMODE3* or *PMODE 1*). The screen may be cleared to one of two background colors in a two-color mode (*PMODE4, PMODE2,* or *PMODE 0*). The statement for clearing the screen is:

PCLS n ←——————→
n = color value chosen from Table 2

There are two color sets that may be used (numbered 0 and 1). The colors available in each set depend upon which *PMODE* is being used. The color set is selected by the *SCREEN* statement.

SCREEN n,m

n = 0 for text screen — m = 0 selects color set 0
n = for graphics screen — m= 1 selects color set 1

The color values of Table 2 are also used to select background or foreground colors for each of the five *PMODEs*. The desired color is selected from the appropriate color set.

Table 2 — Graphic Colors

PMODE	COLORSET	COLORS
1 or 3	0	1 = green, 2= yellow 3 =blue, 4= red
	1	5 = buff, 6 = cyan, 7 = magenta, 8 = orange
0, 2, or 4	0	0 =black, 1 = green
	1	0 = black, 5 = buff

The screen and color selections are added to the subroutine and to the main program to give the following:

Main Program

```
100 REM *SAMPLE PROGRAM*
110 '
120 GOSUB 10000
130 PMODE PN     ←   mode
140 PCLS BK      ←   background
150 SCREEN 1,SC  ←   graphic color set
160 '
999 END          ←——————   separate end of program
                            from subroutine
```

Subroutine

```
10000 REM *SUBROUTINE FOR
10010 REM  GRAPHIC OPTIONS*
10020 '
10030 CLS
10040 INPUT "PMODE NUMBER 0-4";P
N                               accept 0 through 4
10050 IF PN<0 OR PN>4 THEN 10040 ↙
10060 INPUT "COLOR SET 0 OR 1";S
C                               accept only 0 and 1
10070 IF SC<0 OR SC>1 THEN 10060 ↙
10080 INPUT "BACKGROUND COLOR 0-
8";BK
10090 IF BK<1 OR BK>8 THEN 10080 ↘
10200 RETURN                    accept 0 through 8
```

One other possible input choice would be the value of the foreground color to be used. This can be selected by the *COLOR* statement.

COLOR n,m
foreground value ↗ ↖ background value

The acceptable range of values for the foreground color are also dependent on the color set being used. Values from Table 2 are used.

Add to the Main Program:

```
160 COLOR FG,BK←same background selected in Line 10080
          ↖ foreground selected by subroutine Line 10100
```

Add to the SUBROUTINE:

```
10100 INPUT "FOREGROUND COLOR 0-8";FG
10110 IF FG<0 OR FG>8 THEN 10100
```

The complete subroutine is now:

```
10000 REM *SUBROUTINE FOR
10010 REM  GRAPHIC OPTIONS*
10020 '
10030 CLS
10040 INPUT "PMODE NUMBER 0-4";P
N
10050 IF PN<0 OR PN>4 THEN 10040
10060 INPUT "COLOR SET 0 OR 1";S
C
10070 IF SC<0 OR SC>1 THEN 10060
```

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```
10080 INPUT "BACKGROUND COLOR 0-
8";BK
10090 IF BK<1 OR BK>8 THEN 10080
10100 INPUT "FOREGROUND COLOR 0-
8";FG
10110 IF FG<0 OR FG>8 THEN 10100
10200 RETURN
```

You may fill in whatever graphic design that you wish for program lines 160 through 999. Here is an example that draws 25 magenta blocks on an orange background at random positions on the screen. The inputs will produce these graphics values:

PMODE 3 ← **high resolution, 4 colors**
PCLS 8 ← **orange background**
SCREEN 1,1 ← **color set 1**
COLOR 7,8 ← **magenta foreground on the orange background**

Main Program

```
100 REM *SAMPLE PROGRAM*
110 '
120 GOSUB 10000
130 PMODE PN
140 PCLS BK
150 SCREEN 1,SC
160 COLOR FG,BK
```

← **Variables input in subroutine**

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```
170 FOR N=1 TO 25
180 X=RND(240): Y=RND(180)
190 LINE(X,Y)-(X+10,Y+10),PSET,B
F
200 NEXT N
210 '
220 FOR WAIT=1 TO 1000:NEXT WAIT
999 END
```

Add the subroutine (as last shown) and run the program several times using different inputs each time. This will allow you to decide which values produce the best results. Here is how the input display looked before the graphics were drawn.

```
PMODE NUMBER 0-4 ? 3
COLOR SET 0 OR 1 ? 1
BACKGROUND COLOR 0-4 ? 8
FOREGROUND COLOR 0-8 ? 7 ▨
```

← **flashing cursor**

The main program may be changed to display any screen design that you want. Next month we'll take a look at the use of menus.

1000 ... 00E0
END ...01EB

The listing:

```
100 REM *SAMPLE PROGRAM*
110 '
120 GOSUB 10000
130 PMODE PN
140 PCLS BK
150 SCREEN 1,SC
160 COLOR FG,BK
170 FOR N=1 TO 25
180 X=RND(240): Y=RND(180)
190 LINE(X,Y)-(X+10,Y+10),PSET,B
F
200 NEXT N
210 '
220 FOR WAIT=1 TO 1000:NEXT WAIT
999 END
10000 REM *SUBROUTINE FOR
10010 REM  GRAPHIC OPTIONS*
10020 '
10030 CLS
10040 INPUT "PMODE NUMBER 0-4";P
N
10050 IF PN<0 OR PN>4 THEN 10040
10060 INPUT "COLOR SET 0 OR 1";S
C
10070 IF SC<0 OR SC>1 THEN 10060
10080 INPUT "BACKGROUND COLOR 0-
8";BK
10090 IF BK<1 OR BK>8 THEN 10080
10100 INPUT "FOREGROUND COLOR 0-
8";FG
10110 IF FG<0 OR FG>8 THEN 10100
10200 RETURN
```

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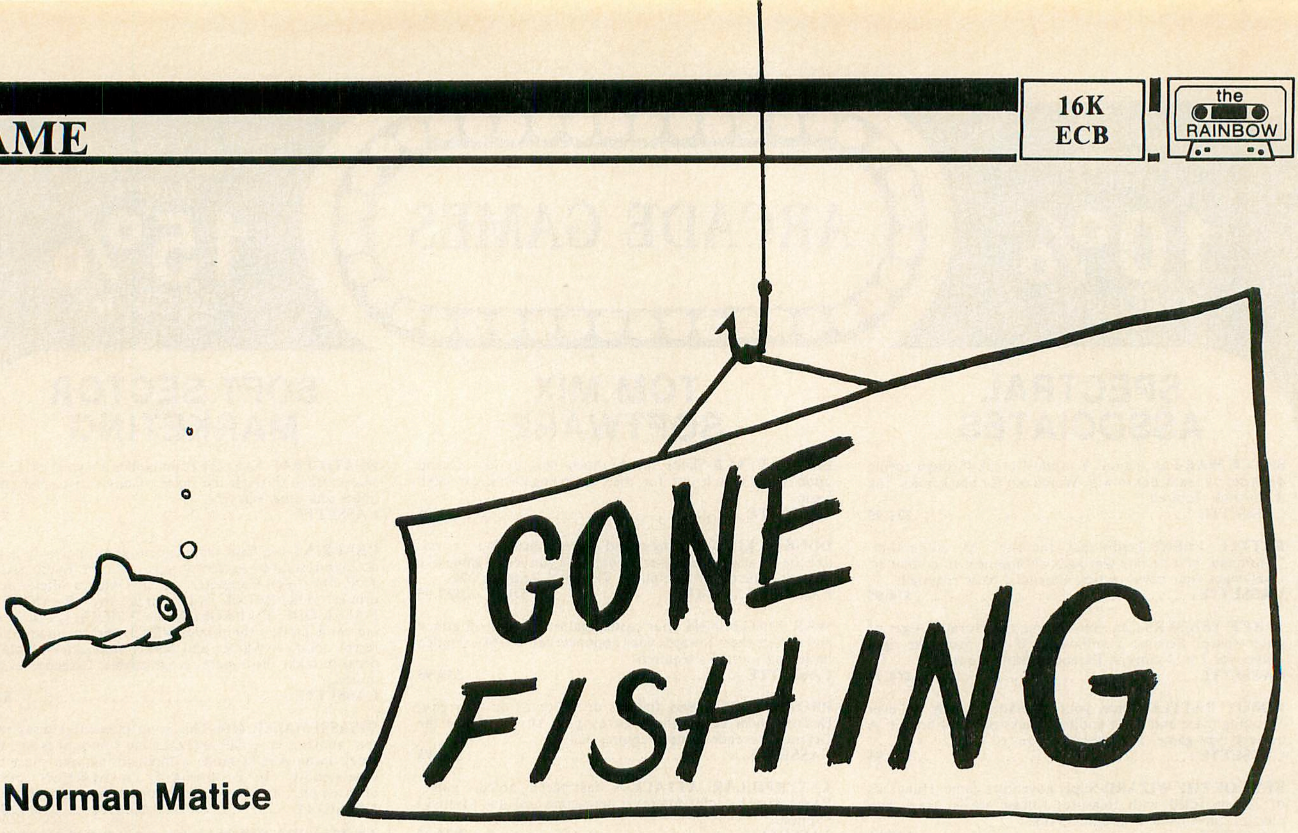


By Norman Matice

Gone Fishing is a high resolution game for a 16K ECB Color Computer. The object of the game is to catch as many fish as you can before it's time to go home for dinner. You control the line with the right joystick. Push it forward to let more line out and pull it back to reel in your line. Unfortunately, someone forgot the bait, so you will have to hook the fish as they swim by.

If a fish should swim across your line it will seem to disappear, because of the turbulence. Actually, redrawing the line would slow play down to an unacceptable level. If your machine can use the high speed poke *(POKE 65495,0)* then play is greatly enhanced.

Lines 1-80 of the program do a general set up of the computer. They dimension arrays, initialize variables, and select resolution, graphic screen and color set. Lines 90-190 draw the title. Lines 200-450 draw the hook, person in the boat, the boat, the pole and the fish. Lines 480 and 490 put the boat on the water. Line 500 randomly selects the end value for the outer loop of a nested *FOR/NEXT* loop. Line 510 then limits your time fishing to the number of passes by the fish as set up in Line 500. To increase the length of the game, add a larger number to IN in Line 500. Lines 520 and 530 randomly pick the depth at which the fish will cross and make sure they stay on their part of the screen.

The game starts at Line 540 where the inner *FOR/NEXT* loop directs the motion of the fish. Lines 550-570 control the fishline and Lines 580 and 590 check the end of the hook. Lines 600-620 draw the hook and line on the screen. Lines 630-670 draw the fish and move them across the screen. Lines 690-770 go to the text screen, print the score and ask if you would like to try again. From here the program either repeats or ends depending on the player's choice.

The only thing left is the subroutine called in Line 590, if you have hooked a fish. Lines 1000 and 1010 take the other fish off the screen. Line 1020 puts the fish you caught on your hook. Line 1030 provides a cranking noise for your reel. The rest of the program is relatively quiet, because fishing is a quiet sport. Lines 1040-1070 control the reeling in of your catch. Lines 1090 and 1100 automatically take the fish off your hook for you. Line 1110 keeps track of how many fish you have caught and of course Line 1120 takes you back to the main program.

Now, wet your line and have fun, but remember—don't stand up in the boat!

(Norman Matice is a junior at the University of Alabama—Huntsville, majoring in electrical engineering.)

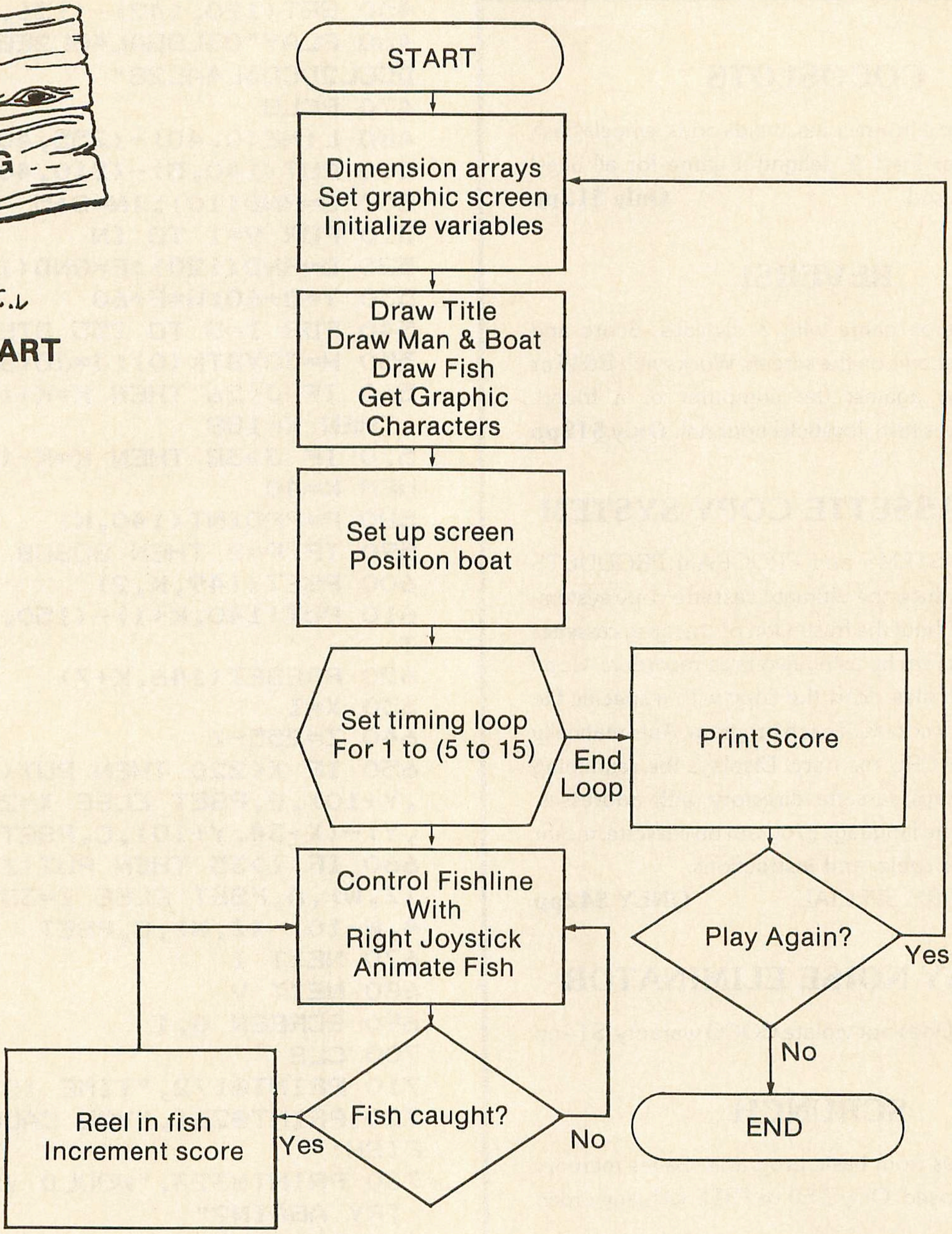
```
200.....020D
580.....059F
END ...0867
```

The listing:

```
1 '"GONE FISHING"
2 ' by NORMAN MATICE
3 'APRIL, 1983
10 DIMA(50),B(50),C(50),G(100),M
(10),N(50),S(50)
20 T=0
30 K=40
40 PCLS
50 PMODE 3,1
60 SCREEN 1,0
70 COLOR 2,3
80 PCLS
90 DRAW"BM40,60;U8R8BD4L4BR4D4L8
"
100 DRAW"BM55,60;U8R8D8L8"
110 DRAW"BM70,60;U8F8U8BG8"
120 DRAW"BM85,60;U8R8BD4L8BR8BD4
L8"
130 DRAW"BM115,60;U8R8BD4BL4L4BD
4"
```

GONE
FISHING

FLOWCHART


START
Dimension arrays
Set graphic screen
Initialize variables
Draw Title
Draw Man & Boat
Draw Fish
Get Graphic
Characters
Set up screen
Position boat
Set timing loop
For 1 to (5 to 15)
End
Loop
Print Score
Play Again?
Yes
No
END
Control Fishline
With
Right Joystick
Animate Fish
Fish caught?
Yes
No
Reel in fish
Increment score

```
140 DRAW"BM130,60;BU8R8BL4D8BR4L
8"
150 DRAW"BM145,60;BU4U4R8BD4L8BR
8D4L8"
160 DRAW"BM160,60;U8BR8D8BU4L8BD
4"
170 DRAW"BM175,60;BU8R8BL4D8BR4L
8"
180 DRAW"BM190,60;U8F8U8BG8"
190 DRAW"BM205,60;U8R8BD4L4BR4D4
L8"
200 CIRCLE(128,96),8
210 CIRCLE(130,130),5,,1.75,0,.5
220 GET(125,129)-(135,135),M,G
230 PSET(126,94,2):PSET(130,94,2
)
240 LINE(126,97)-(130,97),PSET
250 LINE(124,86)-(132,88),PSET,B
F
```

```
260 LINE(120,89)-(136,89),PSET
270 DRAW"BM128,104;NG5ND5F5"
280 CIRCLE(128,109),35,,.35,0,.5
290 LINE(93,109)-(163,109),PSET
300 PAINT(128,111),4,2
310 DRAW"BM125,109;H25D35"
320 GET(93,86)-(163,120),G,G
330 GET(0,0)-(34,10),C,G
340 CIRCLE(163,130),10,,.5
350 DRAW"BM169,135;E10D10H10"
360 PSET(160,130,2)
370 GET(154,125)-(188,135),A,G
380 CIRCLE(93,130),10,,.5
390 DRAW"BM88,135;H10D10E10"
400 PSET(97,130,2)
410 GET(72,125)-(106,135),B,G
420 CIRCLE(128,150),8
430 DRAW"BM128,156;NG6F6L12"
440 PSET(128,148,2)
```

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```
450 GET(120,142)-(136,168),N,G
460 PLAY"O3L8GAL4GL2EGO4L4CL2EL4
DCCL2DCO3L4AL2G"
470 PCLS
480 LINE(0,40)-(255,40),PSET
490 PUT(140,5)-(210,40),G,PSET
500 O=RND(10):IN=O+5
510 FOR V=1 TO IN
520 D=RND(120):E=RND(120)
530 Y=D+60:W=E+60
540 FOR I=5 TO 255 STEP 5
550 H=JOYSTK(0):J=JOYSTK(1)
560 IF J<26 THEN K=K+1 :IF K>188
 THEN K=188
570 IF J>38 THEN K=K-1 :IFK<40 T
HEN K=40
580 P=PPOINT(140,K)
590 IF P=2 THEN GOSUB 1000
600 PSET(149,K,2)
610 PUT(140,K+1)-(150,K+6),M,PSE
T
620 PRESET(146,K+7)
630 X=I
640 Z=255-X
650 IF X<220 THEN PUT(X,Y)-(X+34
,Y+10),B,PSET ELSE X=220 : PUT(X
,Y)-(X+34,Y+10),C,PSET
660 IF Z>35 THEN PUT(Z-34,W-10)-
(Z,W),A,PSET ELSE Z=35 : PUT(Z-3
4,W-10)-(Z,W),C,PSET
670 NEXT I
680 NEXT V
690 SCREEN 0,1
700 CLS
710 PRINT@172,"TIME IS UP!"
720 PRINT@231,"YOU CAUGHT ";T;"
FISH!"
730 PRINT@323,"WOULD YOU LIKE TO
 TRY AGAIN?"
740 A$=INKEY$
750 IF A$="Y" THEN RUN
760 IF A$="" THEN 740
770 CLS:END
1000 PUT(X,Y)-(X+34,Y+10),C,PSET
1010 PUT(Z-34,W-10)-(Z,W),C,PSET
1020 PUT(141,K)-(157,K+24),N,PSE
T
1030 PLAY"O5T150L4ADP4"
1040 H=JOYSTK(0):J=JOYSTK(1)
1050 IF J<26 THEN K=K+1: IF K>18
8 THEN K=188
1060 IF J>38 THEN K=K-1: IF K<40
 THEN K=40
1070 IF K=42 THEN 1090
1080 GOTO 1020
1090 GET(0,0)-(16,26),S,G
1100 PUT(141,41)-(157,67),S,PSET
1110 T=T+1
1120 RETURN
```

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PIPELINE

BEEN HEARING ALL those advertisements on the radio and TV for the CoCo2? Well, it is part of what we hear is the biggest advertising blitz that Radio Shack has ever launched for a single computer. And no wonder! After all, CoCo deserves it and there is little question that it is the leader in its field. What all this means is that there will be a whole bunch of new Color Computer owners by the time you read this . . . and even more of them on the way. Frankly, that is a big vote of confidence from Tandy Towers on our favorite computer—and its future.

* * *

WHAT'S THE EFFECT of the demise of Texas Instruments and Atari in the personal computer market? We hear that TI will be doing what it can to dump its inventory at unheard-of prices. A good buy? We don't think so; after all, who wants a computer that will have almost no support a month from now. The only effect it can have on the CoCo market is a good one: It proves what we have been saying in these pages for some time—that when the shakeout *does* come, our own CoCo will still be riding high. Well, the shakeout is here now and it looks like CoCo, newly streamlined and all, is sitting high, wide and handsome. The proof of the pudding is, perhaps, in the bottom line: While Atari and TI posted huge losses in their latest financial reports, Tandy closed off the year with a 24 percent increase in profits. You can bet a healthy percentage of that was in the computer field and an even higher percentage of the computer profits came from CoCo. Our hats off to the people who are responsible for this at Radio Shack. It's certainly an excellent indication of a good job well done.

* * *

NOW WE FIND that you can receive Slow-Scan Television pictures by way of your CoCo with a new 16K machine language program authored by amateur radio operator Dick Kenny. Slo-Scan was developed for the Ham/CoCo buff who isn't quite ready to invest a lot of money in a dedicated SSTV system.

Anybody interested can probably find out more on the subject by reading A5 ATV Magazine; it's published by QCD Publications, Inc. in Lowden, Iowa.

PICTURE YOUR CRT. Really. Photographically recording data from your monitor for reference or presentations has finally become a simple, exact procedure with the development of the DATACAM™ I and DATACAM™ 35, two color graphic recording cameras from Photographic Sciences Corp. The company says all you have to do is place a DATACAM on any CRT monitor and press a button—no f-stop settings or shutter speeds to fiddle with. Now, we could handle that! You can use conventional film, but with a special film and an AutoProcessor, both available from Photographic Sciences, you can create mounted slides in minutes, working right at your desk. Both cameras come in sizes to fit almost every available monitor. You can write to them at P.O. Box 338, Webster, NY 14580 for further information.

* * *

AND SPEAKING of photography, shutterbugs now have a friend in the software business since PBK & Associates has released its new *BWDEV* Black/White Developer. *BWDEV* is a 16K Non-Extended program that will calculate the variables of the development process and time each step of the way with audible tones. It seems like a good deal for $19.95.

Why not write the company for more info at 5603 Linwood Court, Seabrook, MD (20706) and see what develops?

Ugh. Negative humor.

* * *

AN ALARMING SITUATION is what SGM Corporation wants to prepare you for with a new security system the company is marketing. The SGM system is a plug-together, hard-wired alarm system which will provide electronic security for your CoCo, computer peripherals, and even your stereo, TV or other valuable piece of personal equipment that might have a tendency to walk off when you're not watching. Fooling around with the security system sets off a local alarm; you can connect the system to other alarms, as well. SGM is at 6 West Main Street in Bound Brook, New Jersey. The systems can cost less than $50, or if you wish to secure a lot of valuable hardware you could spend several hundred dollars.

KEYBOARD IN A NOTEBOOK? Yes, but don't try to "enter" anything you've keyed with this one. You won't even get an I/O Error. Computer Practice Keyboard Co. of Union City, NJ, has brought out a line of "keyboards" printed on heavy, plastic laminated sheets, following the layouts of the keyboards of the most popular personal computers, including TRS-80s. The 8½ x 11 sheets are three-hole punched to fit in a standard binder and could be handy for practicing finger positions on a new keyboard while away from the computer or for studying the keyboard of a c[illegible] puter you may be thinking about [illegible] ing. They're $3.95 (or two for $7[illegible] plus $1 for postage. The comp[illegible] address is 616 9th Street in Unio[illegible]

* * *

AN ENHANCED VERSION of Derringer Software's popular *Pro-Color-File* is now on the market, the result of many comments and suggestions they received from users of the original versions. This new database development package can define up to 60 data fields to be stored within each record. It also contains 28 math equations for making easy calculations as records are entered. There are additional report and label generating formats and record indexing capabilities. It even has a menu that can be tailored to an established database so that those not involved in setting up the program can use it. We're looking for a version that will eliminate the Federal deficit and organize our checkbook for a permanent positive balance.

* * *

ONE OF THE BEST innovations we've seen in an Adventure game is what Mark Data Products has done with a number of its former "word" Adventures, *Black Sanctum* and *Calixto Island,* plus a new one called *Shenanigans.* These now combine the best graphics we've seen in an Adventure—real movement and actual scenes as to where you "are" that are a first in the CoCo (or any) marketplace. Best of all, they run from memory—so the cassette version is just as good as the one on disk. Our hat's off to Mark Data for these.

* * *

THE FIRST VERSION OF BASIC available for CoCo OS-9 systems has been released from Computerware. The utility is called *Random Basic* and is very much like the BASIC that Computerware made available for FLEX systems under the same name.

What Are Those Device Numbers For?

Donald D. Dollberg

Model I, III, 4 users often comment about the loss of the *LPRINT* command (allows a BASIC program to send data to the printer) from CoCo's vocabulary. As you know, this function is performed by the command *PRINT #-2.* This modification by Microsoft adds additional versatility to our friendly computer which is not possible with the Models I, III, and 4, sad to say, the Micro Color Computer, MC-10. Now you're probably saying so what — a few extra characters to type. Let's examine what we mean by device numbers and I believe you will see the advantage.

Device numbers allow the user to write a program independent of the source of input or output. For example, suppose you have a program which you want to accept input from either tape, disk or the keyboard and want to give the user the option to choose the device he wants. That's where device numbers come in handy. Before we get much further along, the following table lists CoCo's device numbers:

DEVICE	USE
-2	PRINTER
-1	TAPE I/0
0	KEYBOARD/SCREEN
+1 TO 15	DISK I/0

Using these device numbers, we can control the source for *INPUT* or *LINE INPUT* statements and the destination of *PRINT* and *WRITE* (disk) statements. For example:

```
PRINT #0, “COLOR COMPUTER”
PRINT #-2, “COLOR COMPUTER”
```

The first statement prints to the screen while the second prints to the printer. Now we all know that no one uses device number 0 as shown above, since the simple *PRINT* statement will produce the desired result. This is because the default device number for I/0 is 0.

Now for the “magic.” Did you know that the device number can be replaced with a variable! In so doing, the two *PRINT* statements above can be combined in one statement:

```
PRINT #D, “COLOR COMPUTER”
```

D can be set to -2 when printing to the printer or set to 0 when printing to the screen. On the Model I/III/4 machines you would have to use the following code in place of the simple statement above, for example:

```
IF D=0 THEN PRINT “COLOR COMPUTER” ELSE
IF D=-2 THEN LPRINT “COLOR COMPUTER”
```

The use of the variable D can be expanded to include tape and disk. As an example, suppose we have a database management program (DBM) which like any good DBM has the capability to print reports in a variety of user selected formats. However, no matter how good the DBM, there is always a report format that we would like which the DBM doesn't have. In this case we would like to incorporate the DBM output, say a table of data, into a previously prepared manuscript using our trusty word processor. By simply changing the device number, the output to the printer can be sent to tape or disk where it is stored as an ASCII file (data) and can be read by almost all word processors. The following code shows how simply and effectively this can be

> “[With] an appreciation of device numbers and their usage, you can very easily modify your favorite program . . .”

(Don Dollberg, a commissioned officer with the U.S. Public Health Service, holds a PhD in inorganic chemistry. He has been involved with computers since the early '70s. With Richard White, he is co-author of the TIMS *database management program.)*

accomplished.

```
10 CLS: PRINT "SEND REPORT TO:": PRINT"<1>
   PRINTER": PRINT "<2>DISK": PRINT "<3>
   TAPE"
20 Z$=INKEY$: IF Z$="" THEN 20 ELSE Z=VAL
   (Z$)
25 INPUT "ENTER FILE NAME";F$
30 0N Z GOTO 40, 50, 60
40 D=-2: GOTO 70
50 D=+1: GOTO 70
60 D=-1
70 OPEN "0", #D, F$
80 PRINT #D,---
.  .  .
.  .  .
.  .  .
200 CLOSE #D
```

Let's look at this code in detail. Line 10 is obviously a very crude menu for selecting the output device. Line 20 is the usual *INKEY* routine to obtain a character from the keyboard and convert that character to an integer. A good program would add code to check that only keys 1-3 are accepted. Line 25 simply requests the file name. Depending on which key was pressed, Line 30 selects the appropriate device definition (Lines 40-60). This leads to Line 70 where we open the file with name F$ and device D. Although the *OPEN* statement is not needed when printing to the screen or printer, it is, of course, needed for tape and disk file I/0 and causes no error when using screen or printer.

After opening the file, the program can now continue with its printing task independent of device as long as each *PRINT* statement uses the variable D for device number. If you use the simple *PRINT* without a device number, the data will be printed to the screen. For input, one can do the same thing with *INPUT* or *LINEINPUT* statements in place of *PRINT*.

While all of this sounds great, Murphy's laws do occasionally strike computers. Disk users are aware of the additional output command *WRITE,* which functions differently from *PRINT. WRITE* accepts all device numbers that *PRINT* does and can be used in place of *PRINT.* However, *WRITE* and *PRINT* are not completely interchangeable so it is wise to understand the two before deciding which to use.

Now that you have an appreciation of device numbers and their usage, you can very easily modify your favorite program so that you can examine a report on the screen before printing or save a report to tape or disk instead of printing. On input you can easily have data input from keyboard or from tape/disk. All of this can be done by simply changing the value of a variable. Unfortunately, most programs don't incorporate a variable for device specification. With a good search program you can examine a program and replace all *PRINT* statements with *PRINT#D* and add code similar to that given above to select D.

Software authors take note. You can add much more capability to your program (and make life easier for the user) by simply adding a variable for the device number and give the user the option of controlling the source and destination of data.

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The Right To Know:
It's Also An Obligation

By Tom Nelson
***Rainbow* Contributing Editor**

Out in the regular world we're all pretty secure with our purchases. We go into a supermarket, discount house or whatever and buy a product we can feel and see to be good. We also have some notion of what went into the product and some idea of the market for the product. This makes us feel secure that we are buying a quality product for a reasonable price.

Buying computer software and hardware is just not the same. Consumers are adrift without much help or guidance. It is hard to know if the software or hardware is exactly what we want, even if we have it in our hands, much less when it is in a package. The average consumer does not know what it took to make the product or how many units will be sold. Thus, there is no way to know if the product is priced right or fairly. This ignorance is frustrating and can lead to poor decisions and resentment.

Add to this several other factors and there can be a lot of misunderstanding and dissatisfaction. First, many of us buy through mail order, thus stopping us from seeing the product in advance. Furthermore, software, at least, can be volatile when on disk or tape, leading to insecurity about the product. Also, our expectations from other mature industries are applied to the immature computer industry. When these expectations are inevitably not met, frustration ensues.

Being a consumer in the Color Computer market is tough! In this article I hope to explain the Color Computer market and some industry practices and their reasons so that you the consumer will better be able to assess potential purchases.

The cost of any product is directly related to how many units will be sold and how long it takes to develop the product. Obviously, if only one unit of a product will be sold and it takes two years to develop it, the product will be very expensive. So let's look at the market and development costs for products for the Color Computer.

For our example let's talk about marketing a board which turns the Color Computer into a Cray supercomputer. Due to a giant breakthrough a company has discovered that this board can be made in two years if two people work on it full time. So what is the market for this board?

Well, first, how many Color Computers are there? Who knows? Let's say, just for argument, that there are 300,000. Okay, wow! There are potentially 300,000 people who will buy the card! But wait—how many people really want or can use the card? Well, the card requires 64K and Extended BASIC. That cuts out at least 50 percent of all Color Computer owners. The card also requires a disk drive. There goes another 40 percent. Now we're down to at most 90,000 people who might buy the card.

So now we have to reach those 90,000. How do we do that? In the Color Computer market, primarily through magazine advertisements, and less so with dealers. Remember that the manufacturer cannot just go to a Radio Shack store and sell his product. Back to that 300,000 figure for owners of Color Computers? Well, really, only about at most one-third, or 100,000 can be reached through magazines and dealers. This is according to the magazines' own claims that they have up to 100,000 circulation. Thus, of those 90,000 we have left who have the right size machine, only about 40 percent or so can be reached at all. Now we're down to a market size of 36,000 folks who you are able to interest at all. Of those, 50 percent don't want a Cray card. Instead they want a Control Data card. Now you have 18,000 potential customers.

The whittling will continue until the company can expect sales of about 4,000 units over the product's lifetime. So what do they charge, if they decide to market the Cray card at all? Well, development takes two years for two persons, sales, the development cost goes to $20 per unit. In addition, full time. There's $80,000. Divided by the 4,000 expected

---

*(Tom Nelson was formerly a special assistant attorney general for the State of Minnesota. He currently is general counsel for Softlaw Corporation, makers of the **VIP Library™**, and of **ColorQuest™** games.)*

each unit will cost $50 to manufacture, another $10 to package, another $5 to distribute, $8 to process the order, $4 to advertise, and so on. Now we have a Cray card costing about $60 to produce plus $40 to develop, for a total of $100 per card.

In order to continue to develop more products of equal high quality, the manufacturer needs to make a profit. The profit has to come after the sale, and don't forget that the distributor wants a 60 percent discount. So what price is charged? Well, the $100 plus the profit may only be 40 percent of the final price. Assuming a profit of 20 percent, giving a distributor cost of $120, the final price must be $300 retail.

Oops, I forgot one thing. Once this board gets out there the manufacturer is going to have to give support. Even with the best of operation manuals there are going to be some questions and problems. And what of the returns and exchanges because of the bugs? A conservative cost for these would be $40 per unit to the manufacturer. Add another $100 to the retail price:$400. Of course, the manufacturer could refuse to give support and charge a lower price, but manufacturers have learned that the consumer will demand $40 of support even if they only paid $40 for the product. Thus, support may as well be given, and considered when determining the cost of the product.

And what does the consumer get for that hard earned, top dollar $400? A thin little board with a few chips thrown on, and some weird wires, some photocopied sheets of paper and a phone number. What a rip off! Right? Not according to the facts.

Well there aren't many $400 products selling for the Color Computer. Let's face it. If you only paid $400 for your computer you are unlikely to spend another $400 for something as stupid as a board just to turn it into a Cray supercomputer. After all, you'd rather pay the $10 million for the Cray in the first place.

Still, you are going to buy very few products with such a price tag. In fact, I bet most of you would pay as much as $100 only for truly exceptional products, with $30 to $60 products being your main purchases. What can you expect for your money?

Have you ever wondered why *Visicalc, Multiplan, Wordstar, PFS File, dBase II* and other well known products are available for other popular micros but are not available for the Color Computer? Have you ever wondered why the utility programs that Radio Shack sells for the Color Computer are relatively unsophisticated and inexpensive? The reason is the same. The Color Computer market does not justify the effort.

One thing those companies have learned is that people want high quality, full-featured programs and total support no matter what they pay. People invariably expect a $60 program for the Color Computer to perform as well as a $400 program for the IBM PC, and they expect an equal amount of support. All calc programs have to outperform *Advanced Visicalc* or *Multiplan,* the word processors have to equal *Wordstar,* and database programs have to be at least as good as *dBase II.* Those companies have decided that sales of such programs at such low prices are insufficient in the Color Computer market to justify the extensive development work and after-sale support necessary. This is especially so when those companies look at other potential markets. Thus, only a very few companies have sought to produce high quality software for the Color Computer. Miraculously, despite such odds, many programs for the Color Computer available for about $60 outperform their more expensive counterparts for other computers. Just as miraculously, the companies selling the products stay in existence when the programmers and developers have to work hours in addition to their full time jobs as janitors and soda jerks. Anyone who thinks that software companies developing for the Color Computer are getting filthy rich is just not well informed.

So once a company has put extensive development time into a product to give ultra high quality, has spend money on packaging, distribution, promotion, etc., etc., what's left of the $60 you are willing to pay—or the $25 to $30 that the manufacturer gets from the distributor?

"Consumer rights are tied closely with consumer responsibilities."

Oh, I've forgotten to mention some other costs. Originally there is theoretically a large market for the product. But since it is estimated that only 30 to 40 percent of all software in use has been legitimately obtained, that market has to be decreased by 50 percent, assuming a 50 percent theft factor. There go some more sales which will not help pay for the development of the product.

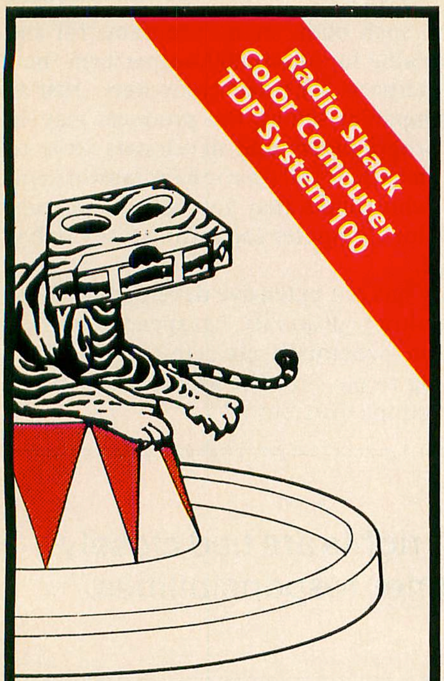
Also, as the product develops, new versions may be produced. Introduction of new hardware may also cause a substantial rewrite. These new versions and rewrites can be very expensive. Nevertheless, the owner of a previous version expects to obtain a sizable discount on the new version, if not get it for free. There's another part of development costs not covered fully.

And while we're here, don't forget that it costs $3 just to answer a simple three minute WATS phone call, about $8 just to process even the smallest order and lots of dough just to open the doors every day. That good old friend overhead must also be considered an added cost for the product.

Well, where are we? We've just come home from a long week at the office. Time to live it up. Honey, get me a drink —no—let's go out tonight and have some fun. Dinner out, to the movie, to a night club afterwards for a night cap, sixty bucks gone for good, and well spent!

Now it's Saturday morning in front of the computer for some hacking. Got to find that right program to do exactly what my mainframe at work does, but on my Color Computer. Never mind that the mainframe program costs at least $10,000 and needs lots of support. The one for my Color Computer has to do the same thing, last a lifetime, be fully guaranteed to satisfy me, come with unending support and cost only $60. Oh, don't forget a full, glossy, four-color user friendly manual, and of course there can be no bugs at all! In fact, I might even need the source code in case I want to modify the program for my special needs. All this for sixty bucks, the same sixty bucks that I frivolously spent last night on food and drink.

Knowing the market is only one part of the problem, since it mostly only affects how we view the cost of the products. But what of how we view the products themselves and what they will do?



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Consumers learn about products from ads, word of mouth and magazine articles and reviews. The ads are self-serving. The consumer must read them carefully and be able to ask the right questions. Word of mouth depends on the credibility and knowledge of the speaker. Then what of the objective press? How many consumers are aware that most of the reviewers for Color Computer products only deign to use a Color Computer when reviewing a product, but own and use another computer for their own purposes? This is very true, especially when dealing with the more sophisticated software. Consumers must question why they can trust the opinion of someone who refuses to use the Color Computer and its products except for the slight period necessary to make money reviewing a program.

But then what of those reviewers devoted to the Color Computer who have used nothing else? They are hardly any better. They are often too inexperienced to adequately assess the quality of a product. They have never used another similar program on another computer, and so have unrealistically low expectations of the program being reviewed. This leads to those glowing reviews which, when relied upon, lead to bad buying choices.

The best way to take care of this problem is to request that the credentials of the reviewer be displayed. What computer do they use at home? How many computers and similar programs have they had experience with? The answers to these questions will better help the consumer decide if the reviewer has any credibility.

This discussion points in one direction. Perspective, we've got to have some perspective. Consumer rights are tied closely with consumer responsibilities. The consumer has the obligation to at least have a marginal understanding of the market to know what to expect, and to make sure the information received from the objective press be based on experience mixed with a total understanding of the Color Computer.

I hope that this discussion has helped give you a better grasp on the confusing and fluctuating Color Computer market. With some of these considerations in mind you are ready to objectively assess the value for your buck. Perhaps the phrase "ripoff" will be reserved for those truly rare occurrences, and the remedies at your disposal will be used for those instances where they really will do some good.

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16K
ECB

Spell Out Your Error Messages

By Richard Smrcina

One of the things that originally turned me off to Radio Shack computers was the way they decided to alert you of an error in your program. I admit that two character codes are easier to program than full-blown error messages, but we have to learn all those codes, and some of the Disk BASIC error codes are not much of an indication of the error at hand. The Atari computers (at least the 400 and 800) use numeric error codes which are even harder to understand.

Which brings me to the programs that I developed. They are designed to provide the computer with full text error messages. They also work from inside BASIC programs to print error messages at a particular line number.

I realize that all but beginners would have probably memorized most of the codes by now, but I wrote the routine anyway, to test my prowess at machine language.

There are two programs—one is for Extended BASIC users and the other is for Disk Extended BASIC users. The difference is the expanded error message table and the steps that are performed after an error has occurred.

The first thing to do before one uses the program is to reserve enough memory for the routine. An easy way to accomplish this is with a BASIC boot-strap program. All this does is automatically clear memory, load the program, and execute it. The one that I use looks like this.

```
10 CLEAR 779,31988
20 LOADM "ERRMSG.BIN"
30 EXEC
40 NEW
```

Save this program on disk and just *RUN* from BASIC and you do not have to worry about remembering the addresses every time you want to use the routine. For tape users, the bootstrap would look like this:

```
10 CLEAR 519,&H7DF8
20 CLOADM "ERRMSG"
30 EXEC
40 NEW
```

All 16K users should note that the &H7 must be replaced by a &H3. Make sure that the machine language program follows the BASIC program on tape.

Here is a description of how the routine works. The program first replaces the RAM hook for the error-handling routine with the address of the new routine (Lines 30-60). Then BASIC is given control. When an error is triggered, instead of going to the ROM Error message routine, my routine is encountered through the RAM hook. Lines 110-180 are BASIC's clean-up routines. This closes files, resets devices, prints the familiar "?" before the error message, etc. Lines 240-260 obtain the address for the error message table and error message respectively. Line 270 jumps to a routine to print out the message. Line 280 gets the address of "Error" text, and again the print routine is called to print it out. Line 300 returns to BASIC's error handler which at that point checks if a program is currently running, if there is, it determines at which line it crashed and prints the "IN XXXXX" message, where "XXXXX" is the line number in which the BASIC program was terminated. Afterwards, the computer is returned to command mode.

This outline follows the disk routine, but the cassette routine is very similar, it just uses some different clean-up routines.

I hope this is helpful.

Listing 1:

```
                      00010 *       NAM     ERRMSG
                      00020 * ERROR MESSAGE ROUTINE FOR DISK BASIC USERS
                      00030 * WRITTEN BY RICH SMRCINA, AUGUST, 1983
7CF3                  00040         ORG     $7CF3
```

```
          A002      00050 PRTCHR  EQU     $A002
7CF3 30   8D 0004   00060 START   LEAX    START1,PCR LOAD ADDRESS OF NEW ERROR
                    00070 *                          ROUTINE
7CF7 BF   0192      00080         STX     $0192   REPLACE IN RAM ERROR HOOK
7CFA 39             00090         RTS             BACK TO BASIC
                    00100 * ENTRY POINT FOR ERROR ROUTINE
                    00110 *  FROM HERE TO THE 'PRTMSS' LABEL IS THE SERIES OF
                    00120 *  ROUTINES THAT BASIC USES PRIOR TO PRINTING ERROR
                    00130 *  MESSAGES, I.E. CLOSE FILES, CLEAN UP, PRINT '?'...
7CFB 35   20        00140 START1  PULS    Y
7CFD BD   AD33      00150         JSR     >$AD33
7D00 BD   D1E5      00160         JSR     >$D1E5
7D03 34   24        00170         PSHS    Y,B
7D05 BD   CA3B      00180         JSR     >$CA3B
7D08 30   62        00190         LEAX    2,S
7D0A BD   A7E9      00200         JSR     >$A7E9
7D0D BD   A974      00210         JSR     >$A974
7D10 0F   6F        00220         CLR     <$6F
7D12 BD   B95C      00230         JSR     >$B95C
7D15 BD   B9AF      00240         JSR     >$B9AF
7D18 35   04        00250         PULS    B       RETRIEVE ERROR CODE
7D1A 4F             00260         CLRA
7D1B 31   8D 028E   00270 PRTMSS  LEAY    ERRADR,PCR LOAD ADDRESS OF ERROR
                    00280 *                       MESSAGE ADDRESS TABLE
7D1F 30   B5        00290         LEAX    [B,Y]   LOAD ADDRESS OF ERROR MESSAGE
7D21 BD   7D2E      00300         JSR     PRTRTN  PRINT MESSAGE AT ADR IN X
7D24 30   8D 02D1   00310         LEAX    ERRTXT,PCR LOAD ADDRESS OF 'ERROR' TEXT
7D28 BD   7D2E      00320         JSR     PRTRTN  PRINT MESSAGE AT ADR IN X
7D2B 16   2F3D      00330 CLEANU  LBRA    $AC6B   BACK TO BASICS ERROR HANDLER
7D2E A6   80        00340 PRTRTN  LDA     ,X+     GET CHAR.
7D30 27   06        00350         BEQ     ENDPRT  IF END RETURN
7D32 AD   9F A002   00360         JSR     [PRTCHR] PRINT IT
7D36 20   F6        00370         BRA     PRTRTN  LOOP AGAIN
7D38 39             00380 ENDPRT  RTS
                    00390 * TABLE OF ERROR MESSAGES
7D39      4E        00400 NF      FCC     /NEXT WITHOUT FOR/
7D49      0D00      00410         FDB     $0D00
7D4B      53        00420 SN      FCC     /SYNTAX/
7D51      00        00430         FCB     $00
7D52      52        00440 RG      FCC     /RETURN WITHOUT GOSUB/
7D66      0D00      00450         FDB     $0D00
7D68      4F        00460 OD      FCC     /OUT OF DATA/
7D73      00        00470         FCB     $00
7D74      46        00480 FC      FCC     /FUNCTION CALL/
7D81      00        00490         FCB     $00
7D82      4F        00500 OV      FCC     /OVERFLOW/
7D8A      00        00510         FCB     $00
7D8B      4F        00520 OM      FCC     /OUT OF MEMORY/
7D98      00        00530         FCB     $00
7D99      55        00540 UL      FCC     /UNDEFINED LINE/
7DA7      00        00550         FCB     $00
7DA8      42        00560 BS      FCC     /BAD SUBSCRIPT/
7DB5      00        00570         FCB     $00
7DB6      52        00580 DD      FCC     /REDIMENSIONED ARRAY/
7DC9      0D00      00590         FDB     $0D00
7DCB      44        00600 DO      FCC     /DIVIDE BY ZERO/
7DD9      00        00610         FCB     $00
7DDA      49        00620 ID      FCC     /ILLEGAL DIRECT/
7DE8      00        00630         FCB     $00
7DE9      54        00640 TM      FCC     /TYPE MISMATCH/
7DF6      00        00650         FCB     $00
7DF7      4F        00660 OS      FCC     /OUT OF STRING SPACE/
7E0A      0D00      00670         FDB     $0D00
7E0C      53        00680 LS      FCC     /STRING TOO LONG/
7E1B      00        00690         FCB     $00
7E1C      53        00700 ST      FCC     /STRING TOO COMPLEX/
7E2E      0D00      00710         FDB     $0D00
7E30      43        00720 CN      FCC     /CAN'T CONTINUE/
7E3E      00        00730         FCB     $00
7E3F      42        00740 FD      FCC     /BAD FILE DATA/
7E4C      00        00750         FCB     $00
7E4D      41        00760 AO      FCC     /ALREADY OPEN/
7E59      00        00770         FCB     $00
7E5A      44        00780 DN      FCC     /DEVICE NUMBER/
7E67      00        00790         FCB     $00
7E68      49        00800 IO      FCC     /INPUT-OUTPUT/
7E74      00        00810         FCB     $00
7E75      42        00820 FM      FCC     /BAD FILE MODE/
7E82      00        00830         FCB     $00
7E83      46        00840 NO      FCC     /FILE NOT OPEN/
7E90      00        00850         FCB     $00
7E91      49        00860 IE      FCC     /INPUT PAST END OF FILE/
7EA7      0D00      00870         FDB     $0D00
7EA9      44        00880 DS      FCC     /DIRECT STATEMENT/
7EB9      0D00      00890         FDB     $0D00
7EBB      55        00900 UF      FCC     /UNDEFINED FUNCTION/
7ECD      00        00910         FCB     $00
7ECE      46        00920 NE      FCC     /FILE NOT FOUND/
7EDC      00        00930         FCB     $00
7EDD      42        00940 BR      FCC     /BAD RECORD NUMBER/
7EEE      0D00      00950         FDB     $0D00
7EF0      44        00960 DF      FCC     /DISK SPACE FULL/
7EFF      00        00970         FCB     $00
7F00      4F        00980 OB      FCC     /OUT OF BUFFER SPACE/
7F13      0D00      00990         FDB     $0D00
7F15      57        01000 WP      FCC     /WRITE PROTECT/
7F23      42        01020 FN      FCC     /BAD FILENAME/
7F2F      00        01030         FCB     $00
7F30      42        01040 FS      FCC     /BAD FILE STRUCTURE/
7F42      0D00      01050         FDB     $0D00
7F44      46        01060 AE      FCC     /FILE ALREADY EXISTS/
7F57      0D00      01070         FDB     $0D00
7F59      46        01080 FO      FCC     /FIELD OVERFLOW/
7F67      00        01090         FCB     $00
7F68      53        01100 SE      FCC     /SET TO NON-FIELDED STRING/
7F81      0D00      01110         FDB     $0D00
7F83      56        01120 VF      FCC     /VERIFY/
7F89      00        01130         FCB     $00
7F8A      57        01140 ER      FCC     /WRITE OR INPUT PAST/
7F9D      0D        01150         FCB     $0D
7F9E      20        01160         FCC     / END OF RECORD/
7FAC      00        01170         FCB     $00
                    01180 * TABLE OF ERROR MESSAGE ADDRESSESS
7FAD      7D39      01190 ERRADR  FDB     NF
7FAF      7D4B      01200         FDB     SN
7FB1      7D52      01210         FDB     RG
7FB3      7D68      01220         FDB     OD
7FB5      7D74      01230         FDB     FC
7FB7      7D82      01240         FDB     OV
7FB9      7D8B      01250         FDB     OM
7FBB      7D99      01260         FDB     UL
7FBD      7DA8      01270         FDB     BS
7FBF      7DB6      01280         FDB     DD
7FC1      7DCB      01290         FDB     DO
7FC3      7DDA      01300         FDB     ID
7FC5      7DE9      01310         FDB     TM
7FC7      7DF7      01320         FDB     OS
7FC9      7E0C      01330         FDB     LS
7FCB      7E1C      01340         FDB     ST
7FCD      7E30      01350         FDB     CN
7FCF      7E3F      01360         FDB     FD
7FD1      7E4D      01370         FDB     AO
7FD3      7E5A      01380         FDB     DN
7FD5      7E68      01390         FDB     IO
7FD7      7E75      01400         FDB     FM
7FD9      7E83      01410         FDB     NO
7FDB      7E91      01420         FDB     IE
7FDD      7EA9      01430         FDB     DS
7FDF      7EBB      01440         FDB     UF
7FE1      7ECE      01450         FDB     NE
7FE3      7EDD      01460         FDB     BR
7FE5      7EF0      01470         FDB     DF
7FE7      7F00      01480         FDB     OB
7FE9      7F15      01490         FDB     WP
7FEB      7F23      01500         FDB     FN
7FED      7F30      01510         FDB     FS
7FEF      7F44      01520         FDB     AE
7FF1      7F59      01530         FDB     FO
7FF3      7F68      01540         FDB     SE
7FF5      7F83      01550         FDB     VF
7FF7      7F8A      01560         FDB     ER
7FF9      20        01570 ERRTXT  FCC     / ERROR/
          45
          52
          52
          4F
          52
7FFF      00        01580         FCB     $00
          7CF3      01590         END     START
00000 TOTAL ERRORS
```

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Listing 2:

```
                00010 *        NAM     ERRMSC
                00020 * ERROR MESSAGE ROUTINE FOR NON-DISK USERS
                00030 * BY RICH SMRCINA, AUGUST, 1983
7DF8            00040          ORG     $7DF8
        A002    00050 PRTCHR   EQU     $A002
7DF8 30 8D 0004 00060 START    LEAX    START1,PCR LOAD ADDRESS OF NEW ERROR
                00070 *                           ROUTINE
7DFC BF 0192    00080          STX     $0192   REPLACE IN RAM ERROR HOOK
7DFF 39         00090          RTS             BACK TO BASIC
                00100 * ENTRY POINT FOR ERROR ROUTINE
                00110 *  FROM HERE TO THE 'PRTMSS' LABEL IS THE SERIES OF
                00120 *  ROUTINES THAT BASIC USES PRIOR TO PRINTING ERROR
                00130 *  MESSAGES, I.E. CLOSE FILES, CLEAN UP, PRINT '?'...
7E00 BD A7E9    00140 START1   JSR     >$A7E9
7E03 BD A974    00150          JSR     >$A974
7E06 BD AD33    00160          JSR     >$AD33
7E09 0F 6F      00170          CLR     <$6F
7E0B BD B95C    00180          JSR     >$B95C
7E0E BD B9AF    00190          JSR     >$B9AF
7E11 4F         00200          CLRA
7E12 31 8D 01AF 00210 PRTMSS   LEAY    ERRADR,PCR LOAD ADDRESS OF ERROR
                00220 *                       MESSAGE ADDRESS TABLE
7E16 30 B5      00230          LEAX    [B,Y]   LOAD ADDRESS OF ERROR MESSAGE
7E18 BD 7E25    00240          JSR     PRTRTN  PRINT MESSAGE AT ADR IN X
7E1B 30 8D 01DA 00250          LEAX    ERRTXT,PCR LOAD ADDRESS OF 'ERROR' TEXT
7E1F BD 7E25    00260          JSR     PRTRTN  PRINT MESSAGE AT ADR IN X
7E22 16 2E46    00270 CLEANU   LBRA    $AC6B   BACK TO BASICS ERROR HANDLER
7E25 A6 80      00280 PRTRTN   LDA     ,X+     GET CHAR.
7E27 27 06      00290          BEQ     ENDPRT  IF END RETURN
7E29 AD 9F A002 00300          JSR     [PRTCHR] PRINT IT
7E2D 20 F6      00310          BRA     PRTRTN  LOOP AGAIN
7E2F 39         00320 ENDPRT   RTS
                00330 * TABLE OF ERROR MESSAGES
7E30    4E      00340 NF       FCC     /NEXT WITHOUT FOR/
7E40    0D00    00350          FDB     $0D00
7E42    53      00360 SN       FCC     /SYNTAX/
7E48    00      00370          FCB     $00
7E49    52      00380 RG       FCC     /RETURN WITHOUT GOSUB/
7E5D    0D00    00390          FDB     $0D00
7E5F    4F      00400 OD       FCC     /OUT OF DATA/
7E6A    00      00410          FCB     $00
7E6B    46      00420 FC       FCC     /FUNCTION CALL/
7E78    00      00430          FCB     $00
7E79    4F      00440 OV       FCC     /OVERFLOW/
7E81    00      00450          FCB     $00
7E82    4F      00460 OM       FCC     /OUT OF MEMORY/
7E8F    00      00470          FCB     $00
7E90    55      00480 UL       FCC     /UNDEFINED LINE/
7E9E    00      00490          FCB     $00
7E9F    42      00500 BS       FCC     /BAD SUBSCRIPT/
7EAC    00      00510          FCB     $00
7EAD    52      00520 DD       FCC     /REDIMENSIONED ARRAY/
7EC0    0D00    00530          FDB     $0D00
7EC2    44      00540 DO       FCC     /DIVIDE BY ZERO/
7ED0    00      00550          FCB     $00
7ED1    49      00560 ID       FCC     /ILLEGAL DIRECT/
7EDF    00      00570          FCB     $00
7EE0    54      00580 TM       FCC     /TYPE MISMATCH/
7EED    00      00590          FCB     $00
7EEE    4F      00600 OS       FCC     /OUT OF STRING SPACE/
7F01    0D00    00610          FDB     $0D00
7F03    53      00620 LS       FCC     /STRING TOO LONG/
7F12    00      00630          FCB     $00
7F13    53      00640 ST       FCC     /STRING TOO COMPLEX/
7F25    0D00    00650          FDB     $0D00
7F27    43      00660 CN       FCC     /CAN'T CONTINUE/
7F35    00      00670          FCB     $00
7F36    42      00680 FD       FCC     /BAD FILE DATA/
7F43    00      00690          FCB     $00
7F44    41      00700 AO       FCC     /ALREADY OPEN/
7F50    00      00710          FCB     $00
7F51    44      00720 DN       FCC     /DEVICE NUMBER/
7F5E    00      00730          FCB     $00
7F5F    49      00740 IO       FCC     /INPUT-OUTPUT/
7F6C    42      00760 FM       FCC     /BAD FILE MODE/
7F79    00      00770          FCB     $00
7F7A    46      00780 NO       FCC     /FILE NOT OPEN/
7F87    00      00790          FCB     $00
7F88    49      00800 IE       FCC     /INPUT PAST END OF FILE/
7F9E    0D00    00810          FDB     $0D00
7FA0    44      00820 DS       FCC     /DIRECT STATEMENT/
7FB0    0D00    00830          FDB     $0D00
7FB2    55      00840 UF       FCC     /UNDEFINED FUNCTION/
7FC4    00      00850          FCB     $00
                00860 * TABLE OF ERROR MESSAGE ADDRESSESS
7FC5    7E30    00870 ERRADR   FDB     NF
7FC7    7E42    00880          FDB     SN
7FC9    7E49    00890          FDB     RG
7FCB    7E5F    00900          FDB     OD
7FCD    7E6B    00910          FDB     FC
7FCF    7E79    00920          FDB     OV
7FD1    7E82    00930          FDB     OM
7FD3    7E90    00940          FDB     UL
7FD5    7E9F    00950          FDB     BS
7FD7    7EAD    00960          FDB     DD
7FD9    7EC2    00970          FDB     DO
7FDB    7ED1    00980          FDB     ID
7FDD    7EE0    00990          FDB     TM
7FDF    7EEE    01000          FDB     OS
7FE1    7F03    01010          FDB     LS
7FE3    7F13    01020          FDB     ST
7FE5    7F27    01030          FDB     CN
7FE7    7F36    01040          FDB     FD
7FE9    7F44    01050          FDB     AO
7FEB    7F51    01060          FDB     DN
7FED    7F5F    01070          FDB     IO
7FEF    7F6C    01080          FDB     FM
7FF1    7F7A    01090          FDB     NO
7FF3    7F88    01100          FDB     IE
7FF5    7FA0    01110          FDB     DS
7FF7    7FB2    01120          FDB     UF
7FF9    20      01130 ERRTXT   FCC     / ERROR/
7FFF    00      01140          FCB     $00
        7DF8    01150          END     START
00000 TOTAL ERRORS
```

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No Treads On Me, Please!

by Gary Ritchie

Snaker is a fast, colorful, Lo-Res action game for a 16K or 32K Extended Color Computer. It requires two joysticks for controlling play. Although written in BASIC, the program has a lot of fast action and is difficult to master.

The program is fairly simple and uses a lot of *REMs* to make it easy to debug. Also note that there is a high speed poke (*POKE* 65495,0) in this game, so if your computer cannot use this poke, then you must make the change indicated in the last *REMs* in the program.

Instructions: You are a somewhat demented snake who has slithered onto a 30-lane freeway. The nearest exit is miles away, so you must slither down the highway as quickly as possible in order to escape. But horrors, it is rush hour, and there are hundreds of buses and trucks bearing down on you! (This snake better have a lot of life insurance.)

At the beginning of the game, your snake is a single graphics block at the top of the screen. Using the right joystick to move back and forth, and the left joystick to control the speed (push forward to go faster), try to avoid the oncoming vehicles. If you don't hit anything, your snake will become longer and longer and will eventually reach the bottom of the screen three times in order to win. Every time you crash, it will send you back up one block, and since this is a timed game, *avoid those cars!* Good luck!

```
40......0129
140.... 040C
370.....0661
530.... 08F2
700.... 0B17
END...0CFD
```

The listing:

```
0 '-----------------------------'
1 '          snaker             '
2 '-----------------------------'
3 '     BY GARY RITCHIE         '
4 '       MARCH 1983            '
5 '-----------------------------'
6 '  BOX 393 BELLEVUE ALBERTA   '
7 '     CANADA  TOK-OCO         '
8 '-----------------------------'
```

(Gary Ritchie, who is currently attending high school, has been programming the Color Computer for about a year. Upon finishing high school he plans to study for a career in the computer field.)

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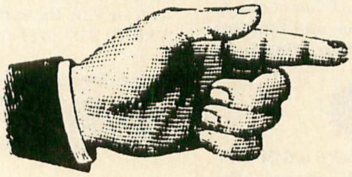

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```
10 POKE 65494,0
20 L=1025:R=1054:P=1039:M=0:HT=0
:Q=0:BS=70000:SC=0:FOR PP=1 TO 5
:READ PL:C(PP)=PL:NEXT PP
30 DATA 159,191,207,239,255
40 CLS RND(4)+1:PRINT@ 192,STRIN
G$(32,"%");:PRINT@224,STRING$(13
,255);:PRINT@237,"snaker";STRING
$(13,255);STRING$(32,"%");
50 PLAY "T4 O3 V25 L8 D G A L4 B
 L8 A G P8 O4 D C# C O3 L4 B L8
A G P8 D G B O4 L4 D L8 C# L4 D
O3 L8 B A G L4... B L8 B O4 E D#
 L4 E O3 L8 B L4 O4 C L8 O3 B O4
 D C L4 O3 B L8 A L4 G L8 B O4 D
 C O3 B P8 A L4 G L8 A G F# E P8
 B P4 O4 E" 'Bublitchki
60 PRINT@ 480,"<<press ANY key T
O START>>";:IF INKEY$="" THEN 60
70 '
80 'setup
90 GOSUB 840
100 CLS:FOR PP=1024 TO 1504 STEP
 32:POKE PP,175:PLAY"T255 O4 A B
":POKE PP+31,175:PLAY"O4 E":NEXT
 PP:TIMER=0
110 '
120 'main loop
130 FOR QQ=1 TO 2:FOR N=148 TO 2
44 STEP 16
140 M=(JOYSTK(0)<6) - (JOYSTK(0)
>57)
150 SP=JOYSTK(3)
160 P=P+M:IF P<L THEN P=L ELSE I
F P>R THEN P=R
170 IF PEEK(P)<>96 THEN 320
180 POKE P,N
190 PLAY"O2 T255 G O3 C"
200 FOR PP=1 TO SP:NEXT PP
210 POKE RND(30)+1504,C(RND(5))
220 POKE RND(30)+1504,C(RND(5))
230 POKE 1504,175:PRINT@ 511,CHR
$(175);
240 NEXT N,QQ
250 '
260 'advance snake
270 L=L+32:R=R+32
280 IF L=1441 THEN POKE P,148:P=
P+32:POKE P,244:GOTO 380
290 POKE P,148:P=P+32:GOTO 130
300 '
310 'crash
320 L=L-32:R=R-32:IF L<1025 THEN
 L=1025:R=R+32
330 FOR PL=1 TO 2:PLAY"O2 T2 L8
B":SCREEN0,1:PLAY"L8 E":SCREEN 0
,0:NEXT PL
340 POKE RND(29)+1505,C(RND(5)):
POKE 1504,175:POKE 1535,175:POKE
 P,96:P=P-32:POKE P,96:POKE P+1,
96:POKE P-1,96:IF P<1025 THEN P=
P+32
350 GOTO 130
360 '
370 'reached bottom
380 HT=TIMER:Q=Q+1:IF Q=3 THEN 4
30
390 FOR PP=1 TO 15:PLAY"O4 T255
A B E":POKE 1504,175:PRINT@ 511,
CHR$(175);:NEXT PP:POKE 1504,175
:POKE 1535,175
400 L=1025:R=1054:P=1039:M=0:TIM
ER=HT:GOTO 130
410 '
420 'win
430 POKE 65494,0:CLS RND(8):PLAY
"V7 O2 T2 L8 F A O3 C L4 F L8 C
L4. F":GOSUB 470
440 CLS RND(8):PLAY"V> O2 T2 L8
A O3 C E L4 G L8 E L4. G":GOSUB
470
450 CLS RND(8):PLAY"V> O3 T2 L8
C F A O4 L4 C O3 L8 A O4 L4. C":
GOSUB 470
460 PLAY"V15":GOTO 510
470 PLAY"T255 O1 E F G B C A E D
 A G F C E D C B G E A D D A B C
 G E A D G C A E F E B C E D G A
 E D B C D E D G B C E D C"
480 RETURN
```

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```
490 '
500 'score
510 CLS RND(4)+1:PRINT@ 168,"YOU
 MADE IT IN:";
520 SC=HT/60:M$=LEFT$(STR$(INT(S
C/60)),3):IF VAL(M$)<1 THEN M$="
00"
530 IF LEN(M$)>2 THEN M$=RIGHT$(
M$,2)
540 S$=LEFT$(STR$(INT(SC-INT(SC/
60)*60)),3):IF LEN(S$)<3 THEN S$
="0" + RIGHT$(S$,1) ELSE S$=RIGH
T$(S$,2)
550 FOR PP=1312 TO 1343:POKE PP,
33:NEXT PP
560 PS$=M$+":"+S$:PRINT@ 301,PS$
;
570 FOR O=1 TO 5:FOR N=1 TO 12:P
LAY"T255 O"+STR$(O)+"N"+STR$(N):
NEXT N,O
580 FOR PP=1 TO 1800:NEXT PP
590 IF HT<BS THEN GOSUB 790
600 '
610 'show best score
620 CLS0:PRINT@ 10,"BEST SCORE";
630 PRINT@ 224,STRING$(32,143);:
PRINT@ 192,STRING$(32,255);:PRIN
T@ 256,STRING$(32,255);
640 PRINT@224,N$;"----------" BS$
;
650 FOR O=5 TO 1 STEP -1:FOR N=1
2 TO 1 STEP -1:PLAY"T255 O"+STR$
(O)+"N"+STR$(N):NEXT N,O
660 FOR PP=1 TO 1800:NEXT PP
670 '
680 'play again
690 SOUND 100,2
700 CLS:PRINT"ANOTHER GAME (Y/N)
"
710 Z$=INKEY$:IF Z$<>"" THEN 720
 ELSE 710
720 IF Z$="N" THEN PRINT"BEST SC
ORE:";N$:PRINT:PRINT BS$:PRINT:G
OTO 850
730 IF Z$<>"Y" THEN SOUND 25,1:G
OTO 700
740 '
750 'reset and start
760 GOSUB 840:L=1025:R=1054:P=10
39:M=0:Q=0:SC=0:GOTO 100
770 '
780 'new best score
790 BS=HT:HT=0:BS$=PS$:CLS RND(8
):PRINT"WHAT IS YOUR NAME";:LINE
 INPUT">>>>?";N$
800 RETURN
810 '
820 'high speed
830 'IF YOUR COMPUTER CANNOT
    TAKE THE HIGH SPEED POKE,
    THEN CHANGE THE FOLLOWING
    LINE TO:
    840 RETURN
840 POKE 65495,0:RETURN
850 END
```

INTRODUCING!

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PEEKCOPY
Copies tape-based software (even most autostarts), displays memory in Hex and ASCII, displays the Start, End, and Exec addresses of ML programs, allows the changing of memory, and more (ML)!
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A ML program that makes your Basic programs use less memory and run more efficiently (faster) by combining lines and removing unnecessary spaces and remarks!
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Hint . . .

Single Disk *COPY*

Here's a feature which can be invaluable for users with a single disk drive. The Radio Shack Disk Manual mentions that use of the *COPY* Command requires two or more drives. This is not necessarily true. A single drive *COPY* can be made by doing the following:

1) Insert disk with file to be copied into the drive 0.
2) Type "COPY "FILENAME/ext:0" and press <ENTER>.
3) There will be one short beep and a notice will appear on the screen instructing the user to insert the destination disk.
4) Insert destination disk and press <ENTER>.
5) Once completed there will be two copies of the program: one original and one on the destination disk.

This method works for all types of disk files including machine language programs.

Monitor Mod For Your CoCo

By Richard Kottke

When was the last time you had to interrupt your word processing because your wife was busy food processing? Has your neighbor's electric garage door opener closed your CoCo? Do electric shavers, hair dryers and toasters make your TV picture do the hula? If so, then you are suffering from the television picture blues. There are many causes; line interference, bad cables, rotten old TV's, but only one good cure: buy a video monitor.

Costing approximately $300, video monitors are quite competitive with their television cousins, with one catch: CoCo was intended for televisions only. In other words, if you ran a cable from the "TO TV" jack on your computer to a video monitor, all you'd get would be a blank screen. How depressing! Will CoCo be forever deprived of the high quality, razor-sharp picture of a video monitor? Will we all be condemned for life to staring at blurry, interference-laden, rotten, gosh-awful televisions while using one of the world's best computers? No! Something must be done!

Well, if you're the adventurous sort, you can have that high-quality, razor-sharp monitor working on your CoCo for the price of some solder and a few feet of cable, with the added bonus of a professional quality sound output. How? Perhaps a little theory will illustrate. Video monitors and televisions are actually pretty much the same—with one exception: televisions get their picture from a radio frequency (R.F.) signal, and monitors use a voltage frequency (I.F.) signal. Some computers, such as the Apple, were designed to be used with monitors, so their video output is an I.F. signal. To be used with a TV, the Apple's I.F. video signal must be run through an R.F. modulator, which is then hooked up to a standard TV set. Aha! The signal we want, then, must be an *un*modulated signal, one that has not been run through an R.F. modulator.

As it turns out, CoCo has an R.F. modulator built into the circuit board. To use a monitor with our CoCo, we must intercept the video signal *before* it gets to the R.F. modulator, while it is still in the I.F. form. At this point, you might as well open up your computer so you can see what I'm talking about.

Turn the computer upside-down and look at the bottom. There are nine medium-sized holes in the case. Get a medium-sized Phillips screwdriver and try to unscrew a screw from each hole (some holes may not have screws—it depends on what revision board you have). The last screw is under the sticker that says "breaking this seal will void your warranty . . ." If you want to be sneaky, you can peel it off and glue it back on later. Once all of the screws are out, turn the computer right side up and remove the case top. Behold the naked CoCo! Touch not any chip, lest it mysteriously zonks out! Turn the case so that you are looking at the back of the computer. You shouldn't notice (see Figure 1) the R.F. modulator in front of you. One of the four leads going into this magic box contains that elusive I.F. signal, which is what we want. Another one carries the sound signal, which we must also tap, because the monitor's I.F. signal does not carry sound.

(Richard Kottke, a native of Crivitz, WI, is a student at the University of Wisconsin—Madison under a Naval ROTC scholarship. He is majoring in electrical engineering.)

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Now, on with the mod. Get the following:

1. A video monitor, preferably one with a built-in audio amp;
2. Two shielded cables with "RCA" plugs (RS #42-2. #42-2371;
3. Some shielded solder;
4. A low watt soldering iron; and
5. Some patience and a steady hand.

First burn, cut, file, or drill a hole in the back of the upper case large enough for the two cables, then thread the cables through the hole. Now look at Figure 2. Solder the center lead from one of the cables to lead #1 from the modulator (this is the I.F. video). Solder the center lead from the other cable to lead #3 from the modulator (this is the sound). Twist the copper shielding from both cables together, and solder it to the case of the modulator. Lastly, mark the video cable (from lead #1) with a piece of tape. Now carefully replace the case top, turn the computer over, and replace the screws (the two small ones go up near the keyboard). If you did everything correctly, the back should look like Figure 3.

To test the mod, plug the cable with the tape into the jack of your video monitor labled "VIDEO IN." Plug the unmarked cable into the jack marked "AUDIO IN," or plug it into your stereo system. When you turn everything on, the video monitor should show the familiar green screen with a black border.

You will probably have to fiddle with the controls a bit to get a really good picture. If, no matter how much you fiddle, the picture looks washed out, reopen the computer and, while it is running, adjust the pot labeled "contrast" on the circuitboard. If you can't find the pot, it should be near the modulator. R pot is a sort of black, disk-like deal with an inset shaft that turns. Adjust this pot until you like what you see, and then reclose the case.

I've had this mod installed for a month now with no problems, except that I had to readjust the contrast pot when switching from TV to monitor. Nothing I've seen can beat that clean, crisp video picture, and it sure cures those old television blues!

Figure 1

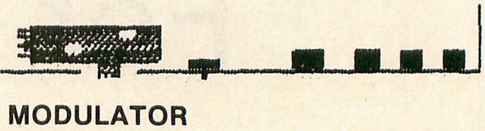


Figure 2

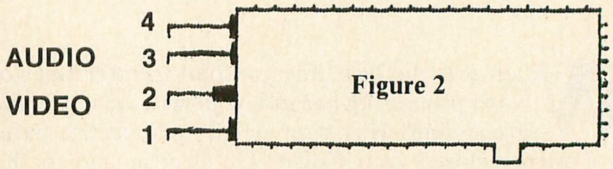
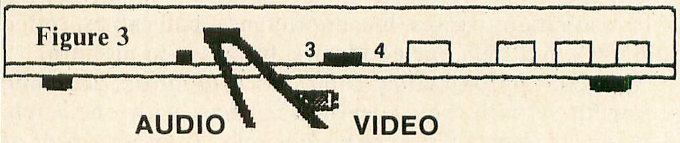


Figure 3



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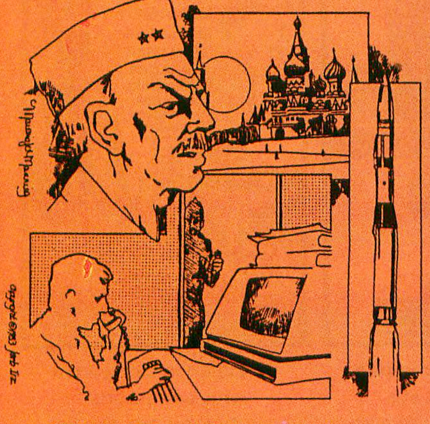

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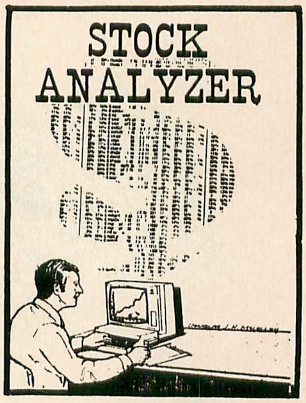

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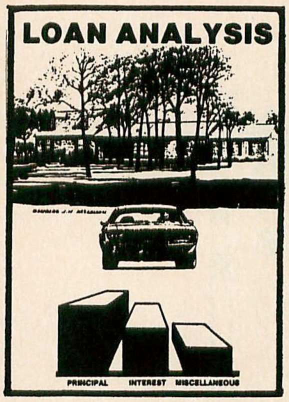

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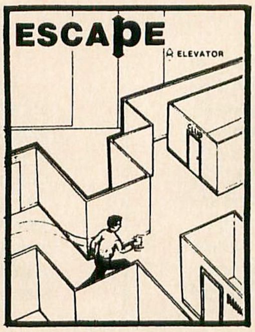

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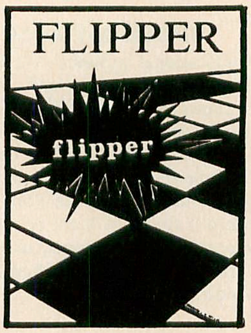

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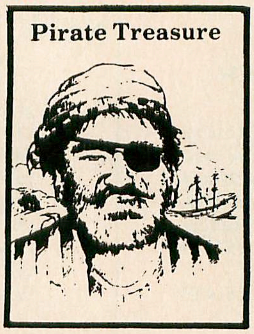

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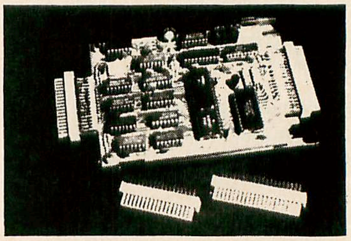

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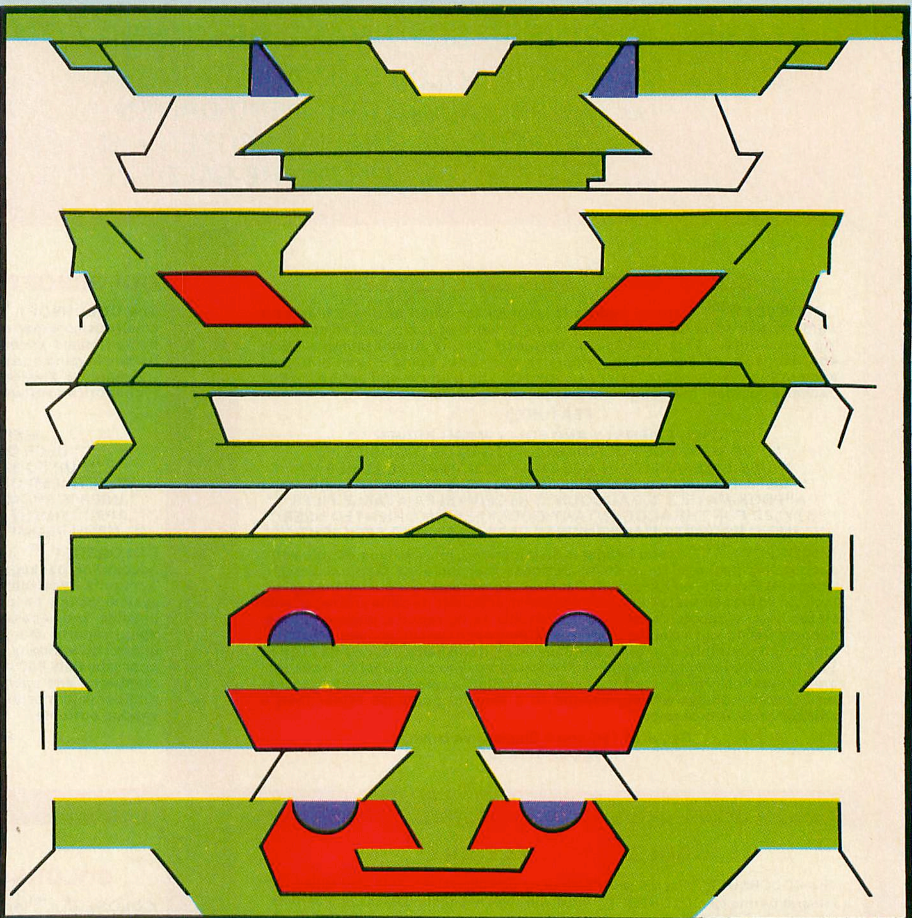

By Stephen Lai

Millions of people have undertaken the rewarding, yet patience-testing challenge of jigsaw puzzles. *Puzzle Sticks* (Program Listing 1) is an entertaining game that requires you to rearrange pieces that consist of thin horizontal sticks, instead of the ordinary, irregularly-shaped pieces.

Puzzle Sticks offers a wide range of pictures and difficulties. There are five preprogrammed pictures. The sixth one, Your Own Creation, lets you retrieve pictures from cassette. *Picture Maker* (Program Listing 2) provides simple commands for you to create original pictures and save them to cassette.

You may select either 17 or 34 sticks. Seventeen sticks are wider and much easier to solve than 34 sticks. The sticks are randomly shuffled an amount of switches that you specify.

The sticks are rearranged by exchanging two sticks at a time. Move the red and green pointers to the two sticks that you wish to be switched and press [ENTER]. The sticks trade positions using the *GET/PUT* statements in lines 310 and 320. The red pointer is moved up and down with the up arrow and down arrow keys. The green pointer is moved with the right arrow and [CLEAR] keys. A pointer may be moved from the top stick to the bottom stick by ordering it up, and vice versa.

(Stephen Lai is a high school freshman in Palatine, Ill. He has enjoyed programming the CoCo for three years.)

The blue number represents the number of switches that have been made. The red pointer represents the number of random computer shuffles that you specified.

The first three pictures, Mr. Grouch, Happy Face, and Buggy, are suitable for younger children when 17 sticks are chosen. The next two pictures, Bouncing Boxes and Spiraling Lines, are much more difficult, especially when 34 sticks are chosen.

Picture Maker lets you create pictures for *Puzzle Sticks.* In *Puzzle Sticks* the picture didn't take up the whole screen. Because of this, the cursor used in *Picture Maker* is limited to that same area. There are basically two types of commands, primary and secondary. The four letters in the upper-left of the screen indicate which primary command has been called. The secondary commands are to be used only when a primary command is in use. In other words, the secondary commands can only be used when one of the four graphic letters are blue.

Secondary commands.

1-4) These four number commands set the color of the primary graphics command. The box in the lower-left of the screen shows the current color. Next, are the eight keys surrounding the S key. These keys move the cursor two pixels in the direction that they are related to the S key. For example, W would move the cursor two pixels up and C would move the cursor two pixels down and to the right.

The eight keys surrounding the K key move the cursor five pixels in the direction that they are related to the K key.

Primary commands

5) The numeral 5 allows you to produce circles. The C on the graphics screen will turn blue when this command is in use. First move the cursor to the location of the circle's radius and press [ENTER]. Then move the cursor to a point on the circle's circumference and press [ENTER]. The circle will then be drawn. Don't worry if part of the circle extends beyond the picture's boundaries.

6) The numeral '6' allows you to draw using the 16 secondary cursor-moving commands. The D on the graphics screen will turn blue when this command is in use. To escape from this command, press R. I have found this command to be the most useful.

7) The 7 allows you to draw single lines. The L on the graphics screen will turn blue when this command is in use. Move the cursor to one end of the desired line and press [ENTER]. Then move the cursor to the other end of the line and press [ENTER]. A line will be drawn from one end to the other.

8) This command allows you to print inside a one-colored border. The border has to be totally enclosed, or else the paint color will leak out and make a mess. The P on the graphics screen will turn blue when this command is in use. This command requires three steps. First, set the box in the lower left of the screen to the paint color and press [ENTER]. Then do the same thing for the border color. Lastly, move the cursor to a location inside the border and press [ENTER]. The bordered area will then be painted.

9) The 9 allows you to save the screen to tape. All unneeded bordering graphics will be cleared away. The picture's name is asked for. Type it in and press [ENTER]. Then position the tape and press [ENTER]. Lastly, press "play" and "record" on the tape recorder and hit [ENTER].

One important thing to remember when producing the pictures is to make sure that no two horizontal sticks are identical. This causes a mixup when the picture appears to be unscrambled while playing *Puzzle Sticks*, but two identical sticks are actually in each other's position.

```
100.....02BF
270.....061F
380....09CA
580....0D8D
730.....112E
END ...148F
```

Listing 1:

```
1 '        PUZZLE STICKS
2 '      BY  STEPHEN LAI
3 '          (C)  1983
10 PMODE3:F=RND(-TIMER):DIMO(34)
,S1(60),S2(60),BX(4),BY(4):FORF=
1TO34:O(F)=F:NEXT:CLS:INPUT"DO Y
OU NEED INSTRUCTIONS (Y/N)";QU$:
IFQU$="Y"THENGOSUB720
20 CLS:INPUT"34 OR 17 STICKS";ST
:IFST<>34ANDST<>17THEN20ELSEIFST
=34THENIN=5:P=8ELSEIN=10:P=5
30 INPUT"NUMBER OF SHUFFLES";SH:
IFSH<1THEN30
40 GOSUB150
50 DATAR4D6L4U6BD10,BDR2NUD5NL2R
2BL4BD4,NDR4D3L4D3R4UBL4BD5,NDR4
D3NL2D3L4NUBD4,D3R4ND3U3BD10BL4
60 DATANR4D3R4D3L4NUR4BU5UBD10BL
4,NR4D3NR4D3R4U3BU2UBD10BL4,BD6E
4U2NL4BD10BL4,NR4D3NR4D3R4U6BL4B
D10,NR4D3R4D3L4NUR4U6BD10BL4
70 FORF=0TO9:READNU$(F):NEXT
80 DRAW"S8BM4,6C3"+NU$(0)+NU$(0)
+NU$(0)
90 COLOR4
100 D1=INT(SH/100):D2=INT((SH-D1
*100)/10):D3=SH-D1*100-D2*10:DRA
W"BM4,120"+NU$(D1)+NU$(D2)+NU$(D
3)
110 FORF=0TO8STEP4:LINE(40-F,9-F
)-(246+F,180+F),PSET,B:NEXTF
120 COLOR2:LINE(32,10)-(40,180),
PSET,BF:COLOR4:LINE(32,9)-(40,9)
,PSET:LINE(32,180)-(40,180),PSET
130 COLOR3:FORF=10TO180STEPIN:LI
NE(28,F)-(32,F),PSET:NEXT
140 GOTO170
150 TT=0:CLS:PRINT:PRINT"PICTURE
S:":PRINT:PRINT" 1) MR. GROUCH":
PRINT" 2) HAPPY FACE":PRINT" 3)
BUGGY":PRINT" 4) BOUNCING BOXES"
:PRINT" 5) SPIRALING LINES":PRIN
T" 6) YOUR OWN CREATION":PRINT:I
NPUTA:IFA>6 THEN150ELSEPCLS2
160 ON A GOSUB340,510,590,430,65
0,840:RETURN
170 FORF=1TOSH
180 A=RND(ST):B=RND(ST):F3=O(A):
O(A)=O(B):O(B)=F3
190 A=10+(A-1)*IN:B=10+(B-1)*IN:
GET(36,A)-(244,A+IN-1),S1:GET(36
,B)-(244,B+IN-1),S2
200 PUT(36,A)-(244,A+IN-1),S2:PU
T(36,B)-(244,B+IN-1),S1
210 NEXT:SCREEN1,0
220 F1=5:F2=10:E1=5:E2=10
230 COLOR2:LINE(25,E1*IN+P)-(30,
E1*IN+P-1),PSET,B:LINE(25,E2*IN+
P)-(30,E2*IN+P-1),PSET,B
240 E1=F1:E2=F2
250 COLOR4:LINE(25,F1*IN+P)-(30,
F1*IN+P-1),PSET,B
260 LINE(25,F2*IN+P)-(30,F2*IN+P
-1),PRESET,B
270 A$=INKEY$:IFA$="^"THENF1=F1-
1ELSEIFA$=CHR$(10)THENF1=F1+1ELS
EIFA$=CHR$(9)THENF2=F2-1ELSEIFA$
=CHR$(12)THENF2=F2+1ELSEIFA$=CHR
$(13)THEN310
280 IFF1>ST THENF1=1ELSEIFF1<1 T
HENF1=ST
290 IFF2>ST THENF2=1ELSEIFF2<1 T
HENF2=ST
300 GOTO230
310 TT=TT+1:D1=INT(TT/100):D2=IN
T((TT-D1*100)/10):D3=TT-D2*10-D1
```

```
*100:COLOR2:LINE(0,0)-(20,90),PS
ET,BF:DRAW"S8BM4,6C3"+NU$(D1)+NU
$(D2)+NU$(D3):G1=10+(F1-1)*IN:G2
=10+(F2-1)*IN:GET(36,G1)-(244,G1
+IN-1),S1:GET(36,G2)-(244,G2+IN-
1),S2
320 PUT(36,G1)-(244,G1+IN-1),S2:
PUT(36,G2)-(244,G2+IN-1),S1:PLAY
"T255L2504CDEFGABGEC"
330 G3=O(F1):O(F1)=O(F2):O(F2)=G
3:FORF=1TOST:IFO(F)=F THENNEXT:G
OTO700:ELSEGOTO230
340 DRAW"C4;BM42,10;S20;B;R6;N;R
27;G1;D1;G1;D3;R1;E1;R3;F1;R1;E1
;R2;F2;E1;R1;E2;F2;R2;E2;F2;R1;E
2;F2;R2;E2;U1;H3;L1;B;M+3,5;D2;F
1;D2;F1;D1;N;D1;R1;F1;D7;G1;L2;U
7;N;E1;D10;G1;D2;G1;D1;G1;D1;G1;
D1;L25;U1;H1;U1;H1;U1;H1;U2;H1;U
3;N;U7;L2;H1;U7;E1;R1;D1;N;F1
350 DRAW"U2;E1;U2;E1;U1":PAINT(1
50,15),1,4
360 DRAW"BM42,10;B;M+7,12;D2;F2;
R5;E3;U1;H2;L1;L5;G2;B;R4;D1;R2;
U1;H1;G1;D1":PAINT(102,70),3,4:P
AINT(95,65),4,4
370 DRAW"B;R18;U1;R2;D1;G1;H1;U1
;B;U2;R4;F2;D2;G2;L4;H3;U1;E2;R2
":PAINT(190,75),3,4:PAINT(185,72
),4,4
380 CIRCLE(148,100),30,4,.8,.86,
.65
390 DRAW"C3;BM42,10;B;M+11,30;E3
;R1;E1;R9;F1;R1;F3;L2;H1;L1;H1;L
8;G1;L1;G1;L3;C4
400 PAINT(140,146),4,3
410 DRAW"BM42,10;B;M+9,8;F1;R5;M
+2,1;B;R9;M+2,-1;R5;E1"
420 RETURN
430 X=RND(205):Y=RND(168):SX=RND
(5)+5:SY=RND(5)+4:C=1
440 FORF=1TO20:X=X+SX:Y=Y+SY:C=C
+1:IFC=5THENC=1ELSEIFC=2THENC=3
450 COLORC
460 IFX>205THENX=205:SX=-SX:ELSE
IFX<OTHENX=O:SX=-SX
470 IFY>168THENY=168:SY=-SY:ELSE
IFY<OTHENY=O:SY=-SY
480 LINE(36+X,10+Y)-(36+(205-X),
10+(170-Y)),PSET,B
490 NEXT
500 RETURN
510 DRAW"C3;BM42,10;S20;B;R11;N;
M-9,+10;R14;M+8,5;M+3,5;M-18,-9;
M-16,+9;D3;G1;D6;F1;R2;U2;H1;U4;
H1;B;M+2,8;F2;N;M+6,10;M-6,+5;M+
6,5;R26;M+8,-5;M-9,-4;N;M-5,+9;M
+3,-4;R2;N;E1;L2;U2;E1;U4;E1;F1;
N;D6;H1;U2"
520 DRAW"B;M-5,+2;U1;H2;L5;H2;U1
;B;L5;D1;G2;L5;G2;D1;B;F7;D1;F1;
R1;F1;R3;E1;R1;E1;U1;H1;L1;H1;L3
;G1;L1;G1;B;H3;L2;H1;U1;E2;R1;E1
;R2;F3;G2;L4;B;R17;L6;H2;E3;R2;F
1;R1;F2;D1;G1;B;D3;M-7,+6;L5;M-8
,-6;M+6,10;R9;M+5,-10"
530 CIRCLE(110,80),8,4:CIRCLE(16
8,80),8,4
540 PAINT(110,80),3,4:PAINT(168,
80),3,4:PAINT(100,80),4,3:PAINT(
178,80),4,3
550 PAINT(100,50),1,3
560 PAINT(140,140),4,3
570 RETURN
580 PCLS2:SCREEN1
590 DRAW"C1BM42,10;S20;B;R19;M-4
,6;N;M-3,1;M-6,-4;M-7,8;M+7,-5;M
+3,2;M-8,5;D13;M+6,2;N;M+10,3;M+
4,6;R11;M+5,-7;N;M-10,4;M+6,-3;U
12;M-10,-3;N;M-3,-2;E3;M+6,3;M-6
,-6;M-6,4;M-4,-6
600 PAINT(80,30),3,1:PAINT(180,3
0),3,1
610 DRAW"B;M+4,10;M+5,1;M+2,4;L4
;M-3,-5;B;L7;M-4,5;L4;M+2,-4;M+6
,-1;B;D6;F1;D1;L2;U1;E1;B;R6;F1;
D1;L2;U1;E1;B;R10;M-8,7;M-9,2;M-
7,-4"
620 PAINT(100,70),4,1:PAINT(170,
70),4,1
```

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```
630 PAINT(120,95),1,1:PAINT(152,
95),1,1
640 RETURN
650 PI=3.1415926:F=RND(4):IFF=2T
HEN650ELSECOLORF:R1=40:R2=85:IA=
RND(20)+30
660 FORF=-PI TOPI STEPPI/20:R1=R
1+1:X1=SIN(F)*R1:Y1=COS(F)*R1:X2
=SIN(F-PI-IA)*R2:Y2=COS(F-PI-IA)
*R2
670 LINE(X1+140,Y1+95)-(X2+140,Y
2+95),PSET
680 NEXT
690 RETURN
700 PLAY"T15L15O5AO4AO3AO2AO1FCD
EFGABO2CDEFGABO3CDEFGABO4CDEFGAB
O5CDEFGAB"
710 A$=INKEY$:IFA$=""THEN710ELSE
RUN
720 CLS:PRINT"----------INSTRUCT
IONS----------";:PRINT:PRINT"
 IN THIS GAME, A PICTURE     (CH
OSEN BY YOU) WILL BE SHUF-   FLE
D UP INTO HORIZONTAL STICKS. YOU
R GOAL IS TO REARRANGE THEM  SO
THAT THEY ARE ALL IN CORRECT ORD
ER."
730 GOSUB820
740 CLS:PRINT:PRINT"    YOU CAN
CHOOSE BETWEEN TWO  DIFFERENT ST
ICK AMOUNTS, 34 OR  17.  IF YOU
CHOOSE 34, THE      STICKS WILL
BE THINNER.":PRINT:PRINT"     TO
MOVE THE STICKS, MOVE THERED AND
 GREEN POINTERS UP AND   DOWN TO
 TWO STICK LOCATIONS AND ";
750 PRINT"PRESS <ENTER>.  THE TW
O STICKS  WILL AUTOMATICALLY SWI
TCH POSI- TIONS."
760 GOSUB820
770 CLS:PRINT"    TO MOVE THE RE
D POINTER, USETHE UP AND DOWN AR
ROW KEYS.":PRINT"     TO MOVE THE
 GREEN POINTER,  USE THE RIGHT A
RROW AND CLEAR   KEYS.":PRINT:PR
INT"    THE BLUE NUMBER REPRESEN
TS  THE NUMBER OF SWITCHES MADE
AND ";
780 PRINT"THE RED NUMBER REPRESE
NTS THE   NUMBER OF COMPUTER SHU
FFLES."
790 PRINT:PRINT"     AFTER YOU HA
VE COMPLETED THEPUZZLE, PRESS AN
Y KEY TO PLAY A-GAIN."
800 GOSUB820
810 RETURN
820 PRINT@490,"HIT ANY KEY";
830 IFINKEY$=""THEN830ELSERETURN
840 CLS:PRINT"WHAT IS THE PICTUR
E'S NAME":INPUTNA$:PRINT:PRINTNA
```

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```
$" IS NOW BEING LOADED...":CLOAD
MNA$:PRINT:PRINT"   LOADING COMP
LETE.":FORF=1TO460:NEXT:RETURN
850 RETURN
```

```
100.....01D3
200.....03E9
450......0546
END ...076C
```

Listing 2:

```
1 '         PICTURE MAKER
2 '       BY  STEPHEN LAI
3 '           (C)  1983
10 X=50:Y=50:C=4
20 PMODE3,1:PCLS2:SCREEN1,0
30 FORF=10TO180STEP5:LINE(28,F)-
(32,F),PSET:NEXT
40 LINE(34,9)-(246,179),PRESET,B
:LINE(2,150)-(24,180),PRESET,BF:
LINE(6,154)-(20,176),PSET,BF
50 C$="BM10,10;N;R10;D15;R10":D$
="BM10,30;R6;F4;D7;G4;L6;U15":L$
="BM10,50;D15;R10":P$="BM10,70;R
6;F4;D2;G4;L6;N;U10;D10"
60 DRAWC$:DRAWD$:DRAWL$:DRAWP$
70 A$=INKEY$:IFA$<"5"ORA$>"9"THE
N70
80 A=VAL(A$)
90 ON A-4 GOTO230,330,440,540,66
```

```
0
100 P1=PPOINT(X,Y):P2=PPOINT(X,Y
-1)
110 A$=INKEY$:PSET(X,Y,5-P1):PSE
T(X,Y-1,P2)
120 PSET(X,Y,P1):PSET(X,Y-1,P2)
130 IFA$=""THEN110
140 IFA$<"5"ANDA$>"0"THENC=VAL(A
$):COLORC:LINE(6,154)-(20,176),P
SET,BF
150 IFA$="Q"THENX=X-2:Y=Y-2ELSEI
FA$="A"THENX=X-2ELSEIFA$="Z"THEN
X=X-2:Y=Y+2ELSEIFA$="X"THENY=Y+2
ELSEIFA$="C"THENX=X+2:Y=Y+2ELSEI
FA$="D"THENX=X+2ELSEIFA$="E"THEN
X=X+2:Y=Y-2ELSEIFA$="W"THENY=Y-2
160 IFA$="U"THENX=X-5:Y=Y-5ELSEI
FA$="J"THENX=X-5ELSEIFA$="M"THEN
X=X-5:Y=Y+5ELSEIFA$=","THENY=Y+5
ELSEIFA$="."THENX=X+5:Y=Y+5ELSEI
FA$="L"THENX=X+5ELSEIFA$="O"THEN
X=X+5:Y=Y-5ELSEIFA$="I"THENY=Y-5
170 IFX<36THENX=36ELSEIFX>244THE
NX=244
180 IFY<10THENY=10ELSEIFY>178THE
NY=178
190 IFA$="R"ANDA=6THEN420
200 IFA=5ORA>6THENIFA$=CHR$(13)T
HENSOUND100,2:RETURN
```

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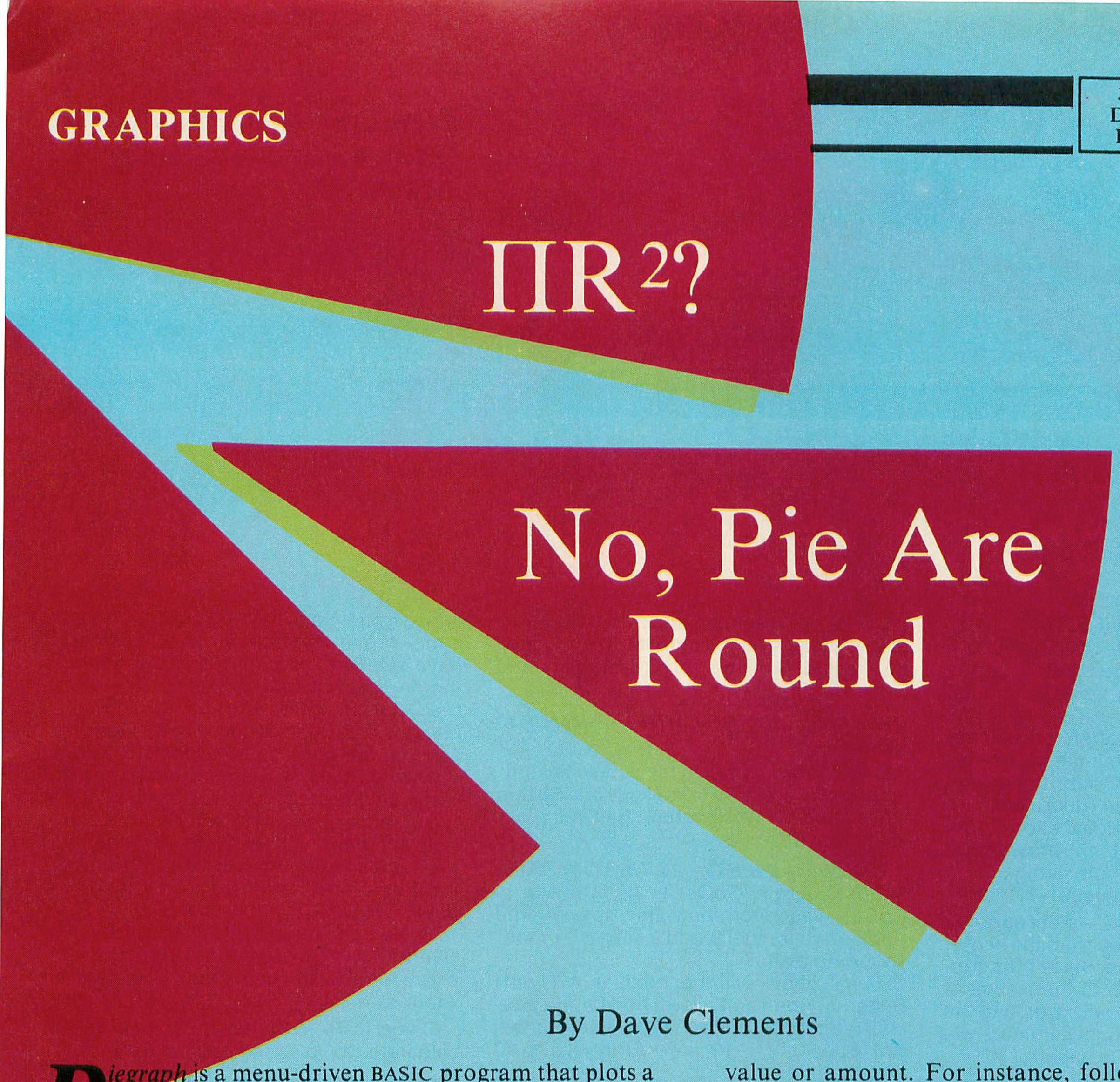
```
210 IFA=6THENRETURN
220 GOTO100
230 DRAW"C3"+C$
240 GOSUB100
250 X1=X:Y1=Y
260 PSET(X,Y,C2)
270 GOSUB100
280 X2=X:Y2=Y
290 SOUND200,2
300 R=SQR((X2-X1)^2+(Y2-Y1)^2):C
IRCLE(X1,Y1),R,C
310 DRAW"C4"+C$
320 GOTO70
330 DRAW"C3"+D$
340 LINE(X,Y)-(X,Y),PSET
350 X1=X:Y1=Y
360 GOSUB100
370 X2=X:Y2=Y
380 COLORC
390 LINE(X1,Y1)-(X2,Y2),PSET
400 X1=X2:Y1=Y2
410 GOTO360
420 DRAW"C4"+D$:SOUND50,2
430 GOTO70
440 DRAW"C3"+L$
450 GOSUB100
460 X1=X:Y1=Y
470 PSET(X,Y,C2)
480 GOSUB100
490 COLORC
500 LINE(X,Y)-(X1,Y1),PSET
510 SOUND220,2
520 DRAW"C4"+L$
530 GOTO70
540 DRAW"C3"+P$
550 GOSUB100
560 CP=C
570 GOSUB100
580 CB=C
590 GOSUB100
600 COLORCB:LINE(34,9)-(246,179)
,PSET,B
610 PAINT(X,Y),CP,CB
620 LINE(34,9)-(246,179),PRESET,
B
630 SOUND25,2
640 DRAW"C4"+P$
650 GOTO70
660 COLOR2:LINE(0,0)-(256,9),PSE
T,BF:LINE(0,0)-(34,192),PSET,BF:
LINE(256,192)-(246,0),PSET,BF:LI
NE(256,192)-(0,179),PSET,BF
670 CLS:PRINT"WHAT IS THIS PICTU
RE'S NAME":INPUTNA$:PRINT:PRINT"
POSITION THE TAPE AND
PRESS <ENTER>.";:LINEINPUTX$:LIN
EINPUT"PRESS PLAY AND RECORD ON
YOUR  TAPE RECORDER AND PRESS <
ENTER>";A$:CSAVEMNA$,1536,7679,0
```



ΠR²?

No, Pie Are Round

By Dave Clements

Piegraph is a menu-driven BASIC program that plots a pie graph on the *PMODE 4* screen. The program is designed for a 32K disk system and a C. Itoh (Prowriter) printer. It is a little over 8K in length, is small enough to fit into a 16K system, and can be easily modified to work with a cassette, with or without a printer.

The program's salient features include:

1) Three methods of data entry, all menu-driven.
2) Option to save input data or plotted graph to disk (or tape with appropriate program changes).
3) Prints title and/or subtitle and input category labels on the display. The titles are automatically centered at the top of the display and the main title can be enlarged to double-sized print.
4) Option to include amounts and computed percentages on the display.
5) Option to highlight any pie section.
6) Option of print and screen backgrounds (dark print on light background or vice versa).

The input routines available are *Manual, Auto,* and *Saved Graph*. The Manual mode is menu-driven and allows you to input up to nine categories or labels and an associated value or amount. For instance, following the data entry screen prompts, you could key in FOOD, 320.00, UTILITY, 125.00, SAVINGS, 250.00, RENT, 465.00, etc. Each category label is suppressed to the left eight characters and each amount to six digits (including decimal) for screen printing. Data entry is completed by simply pressing "Q" and/or [ENTER] anytime after the second label prompt. After the ninth entry, the program will automatically exit the data entry mode. Data correction and re-entry can be completed simply by answering the DATA OK (Y/N)? prompt with an "N." All prompt responses use an *INKEY$* subroutine so an [ENTER] is not required. The entered data can be saved if desired. If data is saved, it can be recalled by selecting the Auto data entry from the input menu. The Saved Graph routine allows you to recall a graph that was previously drawn and saved.

After data has been entered and verified or saved, the program will query you about title size. After responding, you will be asked to enter a title and subtitle (only uppercase letters, numbers, %, /, and = are supported by the *DRAW* strings), and whether you want the amount and computed percentage to be included on the plot. The title and subtitle can be eliminated simply by pressing [ENTER] in response to these prompts. After all prompts are answered, sit back and watch the titles, labels, and graph being drawn on the Hi-Res screen.

The pie sections are drawn in the same order as entered with the first sector labeled "1." The remaining sectors are in clockwise order. If you desire to have all sectors labeled; ie, 1, 2, 3, 4, etc., simply delete Line 1300. Due to the design of

---

(Dave Clements has a master's degree in electronics engineering and is a commander in U.S. Coast Guard. He is presently chief of the Coast Guard's Loran-C Navigation Branch for the U.S. West Coast and Pacific Ocean areas. He and his family live in Novato, Calif.)

RAINBOWfest

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Just look at this great lineup:

Long Beach, California — February 17-19. What a way to get away from the winter doldrums! And what better place than sunny Southern California with thousands of fellow CoCo owners! Fly with CoCo to the sun for the winter. Top flight seminars will draw on many local CoCo experts. It's a holiday weekend, too — so take Monday off and tour Disneyland, Universal Studios, Marineland, the Queen Mary and Hollywood!

New Brunswick, New Jersey — March 30-April 1

RAINBOWfest comes to the populous northeast! It's a close drive from New York, Boston, Philadelphia,, Washington, Baltimore and Long Island.

Chicago — June 22—24. We'll play *RAINBOWfest* again, CoCo! This is the site of CoCo's *very first show* this spring. And right next to the world's largest indoor shopping mall.

Every show will be held at a Hyatt-Regency Hotel and all will be offering special rates for *RAINBOWfest*. Every show will open at 7—10 p.m. Friday, run 10 a.m.—6 p.m. Saturday and close with an 11 a.m.—4 p.m. session Sunday. Each will have a CoCo Community Breakfast featuring an outstanding national speaker from the Color Computer World. And each exhibition will be interspaced with a number of seminar sessions on all aspects of CoCo —from writing in machine language to making your BASIC work better.

But most of all, there will be exhibitors. Lots of them. All ready to demonstrate products of every kind. Some with special programs and hardware items to introduce. Others with show specials.

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KEYNOTE: Bob Albrecht

Advance Ticket Deadline: Feb. 13, 1984

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RAINBOWfest—New Brunswick, N.J.
DATES: March 30—April 1
HOTEL: Hyatt Regency New Brunswick
ROOMS: $59 per night single/double
KEYNOTE: To Be Announced

Advance Ticket Deadline: March 23, 1984

RAINBOWfest—Chicago
DATES: June 22—24, 1984
HOTEL: Hyatt Regency Woodfield
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KEYNOTE: To Be Announced

Advance Ticket Deadline: June 18, 1984

……

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CITY & STATE __________
TELEPHONE __________ ZIP CODE __________
COMPANY __________

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VISA, MasterCharge, American Express accepted.

My Account # __________ Ex. Date: __________
Signature __________

RAINBOWfest Long Beach

Seminar Program And Speakers

Don Inman **Using And Teaching LOGO**

Don is one of the most respected names in the Color Computer field and an expert on graphic techniques in both BASIC and assembly language. His Using Graphics *column appears monthly in the* Rainbow.

Phil Kitchen **Radio Shack Software Support**

Manager of Software Support for Radio Shack, Phil will explain how the Tandy third party software support program works and answer questions about how Radio Shack can be of assistance to authors.

Paul Searby **Software Theft**
Martin Goodman

A panel discussion of one of the most important issues in the CoCo field with Mr. Searby of Computerware and Dr. Goodman of Cheshire Cat Software.

Linda Nielsen **Women's Programs**

Linda, of Moreton Bay Laboratory, and several others active in the CoCo area, will lead a discussion on women's involvement in computing in general and the Color Computer in particular. Theme of the program: It's Not A Man's World.

For women and men who view computers mainly as an annoyance, a special seminar is planned on the general topic How To Live With A Computer At Home.

Bill Nolan **Fantasy Gaming And CoCo**

DungeonMaster, programmer and Rainbow *Columnist, Bill has developed a complete* Dungeons and Dragons *program for CoCo.*

Tom Nelson **Start Your Own Software Business**

Tom is a Rainbow *columnist and one of the owners of Nelson Software Systems.*

The Dragons of Menlo Park **Open Forum**

Members of the Dymax group—including Bob Albrecht, Don and Kurt Inman—and a host of others—will conduct a "laidback California" open discussion on software and book authorship.

Jim Reed **Writing For Rainbow**

Jim, Managing Editor of the Rainbow, *will talk about how you can submit programs and articles to magazines for fun and profit.*

AND: *A special session on assembly language programming . . . and more to be announced later.*

PLUS . . . RAINBOWfest's "CoCo Community" Breakfast featuring Bob Albrecht, Popular Author and *RAINBOW* columnist

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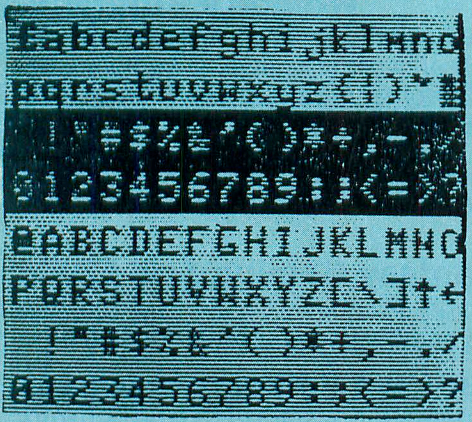

```
£abcdefghijklmno
pqrstuvwxyz{¦}~▒
 !"#$%&'()*+,-./
0123456789:;<=>?
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```

- True lower case characters.
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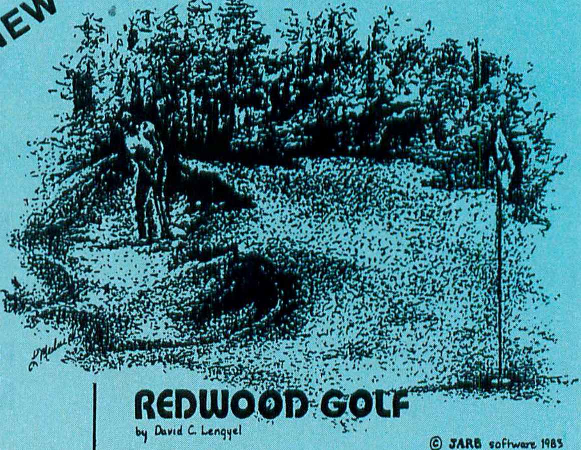

REDWOOD GOLF

by David C. Lengyel

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the characters you may have to change the radius value in the *CIRCLE* command in Line 1310 as this determines the starting screen position for each execution of the *DRAW* routine. Values between 50 and 60 will place the number inside the pie, whereas numbers greater than 78 will place them outside. Both locations create minor problems. "Inside" numbers could be erased by the highlighting option or conflict with the sector plot on small sectors. "Outside" numbers may conflict with the labels or be near the edge, or off, the screen.

After the graph is completed it will remain displayed until any key (except the [BREAK], [CLEAR], or [SHIFT]) is depressed. After depressing any key, you will be asked to respond to another series of options. These include highlighting sections of the pie, saving the graph, and printing a hard copy on your printer. The screen print program I use, *GSPRP,* is an excellent one from Custom Software Engineering, Inc. that permits several options such as copy size and position on the paper. If you answer "Y" to the "WANT HARD COPY (Y/N)?" prompt you will be presented with questions peculiar to the *GSPRP* program.

When the hard copy is completed, or after you answer "N" to the prompt, "FINISHED?" will appear on the text screen. A "Y" response will clear the screen and return the OK prompt and flashing cursor. An "N" response will display a reverse print and background question. Another "N" simply returns to the Data Input Menu, whereas a "Y" to this question will change future screen displays before returning you to the Data Input Menu.

The program contains limited error trapping. All file names are suppressed to eight characters; pressing "Q" after entering the "Auto" data entry, "Save Data" or "Save Graph" routines will return you to the Data Entry Menu or to the next line in the program (as if you did not select that particular option). Program layout is shown below.

Program Summary

Lines 1-7	Program credits
Lines 10-70	Opening logo, load ML screen dump, and *DIM*ension
Line 40	Hi-Res text drawing routine
Lines 100-120	Auto data input
Line 168	Saved graph input
Lines 190-200	Print and background selection
Lines 210-370	Menu and Data input
Lines 400-500	Pie graph plot routine
Lines 570-990	*DRAW* strings for letters, numbers and special characters
Lines 1040-1120	Screen format prompts; title, subtitle and label printing
Lines 1150-1230	Prompts for screen labels, amounts, and percentages
Lines 1260-1340	Locates center of pie slices for highlighting routine
Lines 1370-1460	Selection and painting of highlighted sectors
Lines 1490-1510	Data save routine
Line 1540	Graph save routine
Lines 1570-1680	Printer copy routines
Line 1690	*PCLEAR*
Line 1700	Data for opening logo border

Program changes to accommodate systems configured differently are described in the following paragraphs.

If you do not have a C. Itoh printer, Lines 50, 520, and Lines 1570-1680 must be deleted or changed to accommodate your printer and screen print routine. If these lines are deleted, you must also change *GOTO50* to *GOTO60* in Line 30.

For a 16K system, change & H7 in Lines 10, 50, and 1640 to &H3 (or to memory locations for your particular screen print routine requirements). To conserve space, all lines that do not end in 5 or 0 can also be deleted.

For a cassette system change:

Lines 50, 160, 1610	*LOADM* to *CLOADM*
Lines 110, 1490	#1 to #-1
Lines 120, 1510	#1 to #-1 and add #-1 after *CLOSE*
Lines 1500:	*WRITE#1* to *PRINT#-1*
Lines 1540:	*SAVEM* to *CSAVEM*

If you have the screen dump program *GSPRP* and cassette system, there is one instance where you would have to reload *GSPRP.* This occurs if you have printed a full-page (double-sized) hard copy then want a regular-sized print. When you do this, *GSPRP* is reloaded in Line 1610; therefore, your tape must be repositioned. Appropriate prompts should also be placed in the above lines to remind you to position the tape, press play and record, etc. I'll leave these to your preference.

Drawing speed on the high resolution screen has been increased by the *POKE* 65495,0 command. If your system cannot operate in the fast mode then *POKEs* should be removed from Lines 410, 1090, and 1390.

For those of you who want a copy of *Piegraph* and don't get *Rainbow On Tape* or don't want to key in the program, send me $5 and I will send a copy on disk (or tape if requested), less the screen print machine language program.

I've enjoyed developing this program. It should be error-free, but if you have any problems or want to suggest improvements please contact me. Please feel free to experiment and modify the program for your specific needs.

```
40.....01CE   1038 ...0F40
200.....0451  1148 ...11BE
398.....06B2  1369 ...141D
569.....08F5  1540 ...169C
770.....0C24  END ...196C
```

```
1 '********************************
2 '          PIEGRAPH
3 '       DAVID CLEMENTS
4 '     1099 ROSALIA DRIVE
5 '     NOVATO, CA   94947
6 '        (415) 897-8342
7 '********************************
10 CLEAR500,&H7D65:FORKK=&H7D65
TO &H7D8B:READXX:POKEKK,XX:NEXTK
K:POKE346,201:DEFUSR0=&H7D65:GOT
O30
20 IK$=INKEY$:IFIK$=""THEN20ELSE
RETURN
30 CLS(3):PRINT@235,"pie graph";
:POKE1024+238,128:XJ=USR0(XJ):FO
RZZ=1TO500:NEXT:GOTO50
38 '
39 'DRAW HI-RES TEXT
```

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- Relation Operators: =, >, <, < =, > =, < >
- Logic Operations: AND, OR, NOT
- Conditional Formula: IF . . . THEN . . . ELSE
- Trig Functions: SIN, COS, TAN, ATN

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- Rewrite entire screen
- Page Forward through text
- Page Backward through text
- Mark present line for automatic centering on output
- Insert new text (Insert mode)
- Type over old text (Exchange mode)
- Screen Display is 32x19 in normal text editing modes
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- Screen Display in all modes is true Upper/Lower case characters with descenders
- Over 13.5K file size in 32K machines
- Continuous memory display
- Save text file (disk or tape)
- Load text file (disk or tape)
- All I/O errors trapped and recoverable
- Jump to beginning or end of text
- Find any string of characters in text
- Global replacement of one string in text for another

- **True block-text Move command**
- **Smooth cursor movement over text in any direction (including vertical)**
- **Smooth screen scroll for easier proof reading**
- **Auto Key-Repeat will automatically repeat any key that is held down**
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- Display disk directory (disk only)
- Display Free disk space available
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- Dynamic margin changes within text
- Select Top margin, Bottom margin, and Page length
- Choose number of duplicate copies
- Page Pause, for single sheet users, if desired
- Optional page numbering begins with any selected page number
- Printer Font codes are user definable
- All printer format options may be changed dynamically within text
- Any string of HEX characters may be imbedded within text to send any special control codes to your printer
- An Eject (top of form) command may be inserted within text
- Variable Text Merge symbols may be inserted anywhere within text
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```
40 FOR X1=1TO LEN(X$):Y1=ASC(MID
$(X$,X1,1))-32:DRAW"XL$(Y1);":NE
XT:RETURN
50 LOADM"GSPRP":DEFUSR1=&H7D90:D
EFUSR2=&H7D92
60 GOTO1690
70 DIML$(60),F(10),A(10),B(10),P
(10),PT(10):CC=0:GOTO570
98 '
99 ' INPUT PREVIOUS SAVED DATA
100 CLS:INPUT"DATA FILE NAME";NF
$:IFNF$="Q"THEN210 ELSE NF$=LEFT
$(NF$,8)
110 OPEN"I",#1,NF$:INPUT#1,I,SUM
F
120 FOR KK=1TO I-1:INPUT#1,F$(KK
),F(KK):NEXT:CLOSE
130 GOTO340
158 '
159 'INPUT SAVED GRAPH
160 CLS:INPUT"GRAPH NAME";FI$:IF
FI$="Q"THEN210 ELSE FI$=LEFT$(FI
$,8):LOADMFI$:SCREEN1,0:GOSUB20:
GOTO520
188 '
189 ' SCREEN BACKGROUND SELECTIO
N
190 CLS:PRINT:PRINT:PRINT"  DO Y
OU WANT LIGHT PRINT ON
DARK BACKGROUND OR
 DARK PRINT ON
 LIGHT BACKGROUND?":PRINT:PRINT"
 PRINT TYPE? <D>ARK OR <L>IGHT":
SOUND140,1:GOSUB20
200 IFIK$="D"THEN PR=0:BG=1 ELSE
 PR=1:BG=0
210 CLS:PRINT@72,"DATA ENTRY MOD
ES":PRINT:PRINT:PRINT:PRINTTAB(1
0)"<M>ANUAL":PRINTTAB(10)"<A>UTO
":PRINTTAB(10)"<S>AVED GRAPH":SO
UND140,1:GOSUB20
220 IFIK$="M"THENGOTO260ELSE IFI
K$="A"THENGOTO100ELSE IFIK$="S"T
HENGOTO160
230 CLS:PRINT"MUST CHOOSE AVAILA
BLE OPTION":SOUND5,3:FORZZ=1TO80
0:NEXT:GOTO210
258 '
259 'DATA INPUT
260 CLS:I=0:SUMF=0
270 I=I+1:IFI>9THEN340
280 INPUT"DESIRED LABEL";F$(I)
290 F$(I)=LEFT$(F$(I),8)
300 IFF$(I)=""ORF$(I)="Q"AND I>1
THEN340
310 INPUT"AMOUNT/VALUE ";F(I)
320 SUMF=SUMF+F(I)
330 GOTO270
```

FILMASTR

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YOU are in complete control of this friendly program with no programming knowledge required. You design the data screen with up to 20 fields by moving the cursor on screen with the arrow keys and typing in the field names. FILMASTR takes care of all of the rest.

Enter data by just filling in the blanks. This form fill-in is easy and natural to use. You can even copy data from the previous record with one key-stroke. Add records, delete records, change records without fuss.

Tell FILMASTR to sort your file on any field that you want or to retrieve a particular record and the job is done with super-human machine language speed. FILMASTR will find a single record or a group of records that meet your request and will save those records as a separate file if you want to.

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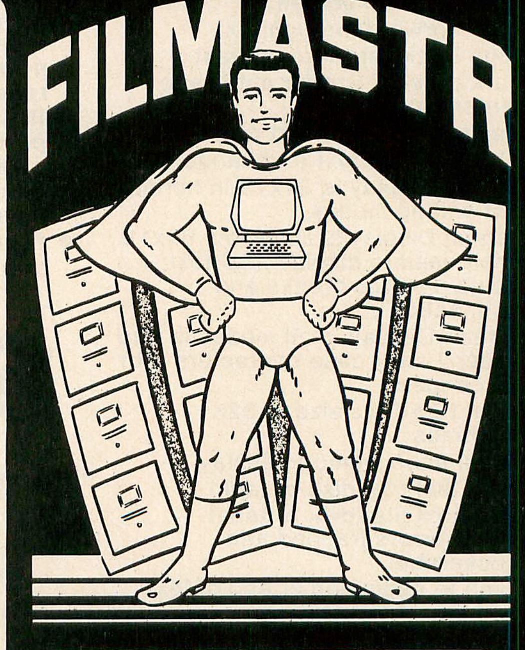

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```
340 CLS:FORK=1TO I-1:P(K)=F(K)/S
UMF:PRINTF$(K);TAB(10)F(K);TAB(2
0);:PRINTUSING".##";P(K):NEXT
350 PRINT:PRINT"      DATA OK (Y/
N)?":SOUND140,1:GOSUB20
360 IFIK$="N"THENGOTO260
370 CLS:PRINT:PRINTTAB(5)"SAVE I
NPUT DATA (Y/N)?":SOUND140,1:GOS
UB20:IFIK$="Y"GOSUB1490
398 '
399 'PIEGRAPH PLOT
400 PMODE4,1:COLOR PR,BG:PCLS:GO
SUB1040
410 POKE65495,0:CP=0
420 LINE(153,115)-(78,115),PSET
430 FORK=0TO I-2
440 CP=CP+P(K+1)
445 IFK=I-2 AND ABS(1.0-CP)<.005
THEN CP=1.0
450 CIRCLE(78,115),75,PR,.93,0,C
P:S=PEEK(190):E=PEEK(192)
460 LINE(S,E)-(78,115),PSET
470 NEXT
480 POKE65494,0
490 GOSUB20:GOSUB1370
500 SCREEN1,0:GOSUB20
510 CLS:PRINT:PRINTTAB(7)"SAVE G
RAPH?":SOUND140,1:GOSUB20:IFIK$=
"Y"THENGOSUB1540
520 CLS:PRINT:PRINTTAB(8)"WANT H
ARD COPY?":SOUND140,1:GOSUB20:IF
IK$="Y"THENGOSUB1570
530 CLS:PRINT:PRINTTAB(11)"FINIS
HED?":SOUND140,1:GOSUB20:IFIK$="
Y"THENCLS:END
540 CLS:PRINT"WANT TO REVERSE PR
INT AND BACK- GROUND (Y/N)?":SOU
ND140,1:GOSUB20:IFIK$="Y"THEN TE
=PR:PR=BG:BG=TE:GOTO210 ELSE GOT
O210568 '
569 ' LTRS & NUMBERS
570 L$(33)="BM+1,0U4E2R1F2D4BL3B
U2R2BD2BR3"
580 L$(5)="BM+1,0E6BL5D1R1U1L1BF
5D1L1U1R1BD1BR3"'%
590 L$(34)="BM+2,0U6BL1R3F1D1G1L
1R1F1D1G1L3BR7"
600 L$(15)="NE6BR7"'/
610 L$(35)="BM+5,-5H1L2G1D4F1R2E
1BD1BR3"
620 L$(29)="BM+1,0BU2R3BU2L3BD4B
R7"'=
630 L$(36)="BM+1,0U6R2F2D2G2L3BR
7"
640 L$(37)="BM+5,0L4U6R4BD3BL2L1
BD3BR6"
650 L$(38)="BM+1,0U6R4BD3BL2L1BD
3BR6"
660 L$(39)="BM+5,-5H1L2G1D4F1R3U
```

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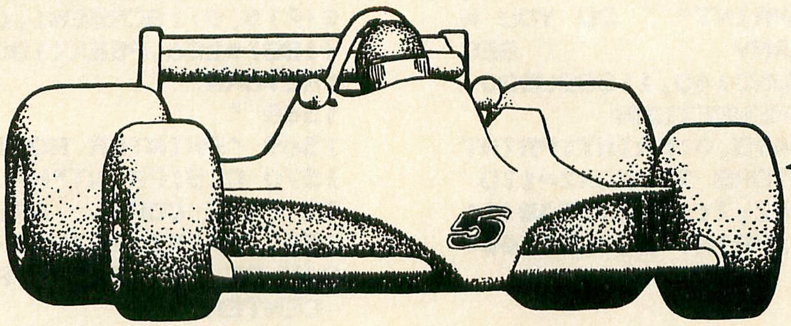
```
2L1R3BR3BD2"
670 L$(40)="BM+1,0U6BR4D6BL3BU3R
3BR4BD3"
680 L$(41)="BM+5,-6L4R2D6L2R4BR3
"
690 L$(42)="BM+1,-2D1F1R2E1U5BD6
BR3"
700 L$(43)="BM+1,0U6D3R1E3G3F3BR
3"
710 L$(44)="BM+1,-6D6R4BR3"
720 L$(45)="BM+1,0U6R1F2D1U1E2R1
D6BR3"
730 L$(46)="BM+1,0U6R1D1F4D1R1U6
D6BR3"
740 L$(47)="BM+5,-1U4H1L2G1D4F1R
2BR4"
750 L$(48)="BM+1,0U6R3F1D1G1L2BR
6BD3"
760 L$(49)="BM+5,-1U4H1L2G1D4F1R
2F2BE2"
770 L$(50)="BM+1,0U6R3F1D1G1L2R1
D1F2BR3"
780 L$(51)="BM+1,-1F1R2E1H4E1R2F
1BD5BR3"
790 L$(52)="BM+3,0U6L3R6BR2BD6"
800 L$(53)="BM+1,-6D5F1R2E1U5BD6
BR3"
810 L$(54)="BM+1,-6D4F2E2U4BD6BR
3"
820 L$(55)="BM+1,-6D6R1E2U1D1F2R
1U6D6BR3"
830 L$(56)="BM+1,0U1E4U1BL4D1F4D
1BR3"
840 L$(57)="BM+1,-6D1F2D3U3E2U1B
D6BR2"
850 L$(58)="BM+1,-6R4D1G4D1R4BR3
"
860 L$(0)="BM+1,0BR7"
870 L$(14)="BM+2,0R1BR2"
880 L$(17)="BM+2,-4E2D6BR4"
890 L$(18)="BM+1,-5E1R2F1D1L1G3D
1R4BR3"
900 L$(19)="BM+1,-1F1R2E1U1H1E1U
1H1L2G1BD5BR7"
910 L$(20)="BM+4,0U6L1G2D1R5BD3B
R3"
920 L$(21)="BM+1,-1F1R2E1U1H1L3U
3R5BR3BD6"
930 L$(22)="BM+5,-6L3G1D4F1R2E1U
1H1L2BR6BD3"
940 L$(23)="BM+1,-6R5D2G4BR7"
950 L$(24)="BM+1,-1U1E1R2E1U1H1L
2G1D1F1R2F1D1G1L2BR6"
960 L$(25)="BM+1,0R3E1U4H1L2G1D1
F1R2BD3BR4"
970 L$(16)="BM+6,-1U4H1L2G1D4F1R
2BR4"
980 L$(13)="BM+2,-3R3BD3BR2"
990 GOTO190
1038 '
1039 ' HIRES SCREEN FORMAT
1040 CLS:PRINT" WANT LARGE TITLE
 PRINT (Y/N)?":PRINT"      LARGE
 = 15 CHAR MAX":PRINT"       STD
  = 30 CHAR MAX":SOUND140,1:GOSU
B20:IFIK$="Y"THEN PRINT@33,">>>>
";ELSE PRINT@65,">>>>";
1050 PRINT@96,"":INPUT"GRAPH TIT
LE";TI$:INPUT"SUBTITLE";STI$:TP$
=IK$
1060 CLS:PRINT" WANT PERCENTAGES
 AND AMOUNTS ON        GRAPH (Y/N
)?":SOUND140,1:GOSUB20
1070 LA$=IK$:SCREEN1,0
1080 IFTP$="Y"THEN TC=16:TS$="S8
":T1S$="24":TI$=LEFT$(TI$,15):X1
$="13" ELSE TC=8:TS$="S4":T1S$="
18":TI$=LEFT$(TI$,30):X1$="9"
1090 POKE 65495,0:X$=TI$:IFTI$="
"THEN1110
1100 P$="BM"+STR$(128-INT(TC*(LE
N(TI$))/2))+","+X1$+";"+TS$+";":
DRAWP$:GOSUB40
1110 X$=LEFT$(STI$,30):IFSTI$=""
THEN1150
1120 P$="BM"+STR$(128-INT(8*(LEN
(X$))/2))+","+T1S$+";S4;":DRAWP$
:GOSUB40
1148 '
1149 ' PRINT LABELS?
1150 FORK=1TO I-1
1160 PL$="BM155,"+STR$(20+18*K)+
";S4;"
1170 ZL$="BM162,"+STR$(29+18*K)+
";"
1180 PT(K)=100*P(K)
1190 X$=STR$(K)+" "+F$(K):DRAWPL
$:GOSUB40
1200 IFLA$="N"THEN1230
1210 QQ$=STR$(PT(K)):RR$=STR$(F(
K))
1220 X$=LEFT$(RR$,7)+LEFT$(QQ$,4
)+"%;":DRAWZL$:GOSUB40
1230 NEXT
1258 '
1259 'SECTOR CENTER LOCATIONS
1260 SUMF=0:PSUM=0
1270 FORK=0TO I-1
1280 SUMF=SUMF+P(K+1):PSUM=SUMF-
P(K+1)/2
1290 CIRCLE(78,115),70,BG,.93,0,
PSUM:A(K)=PEEK(190):B(K)=PEEK(19
2):IFK=0THEN B(K)=B(K)+3
1300 IFK>0THEN1340
1310 CIRCLE(78,115),72,BG,.93,0,
PSUM:S=PEEK(190):E=PEEK(192)
1320 LL$="BM"+STR$(S)+","+STR$(E
)+";"
1330 X$=STR$(K+1):DRAWLL$:GOSUB4
0
```

YOUR COLOR COMPUTER JUST GOT WHEELS!



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You accelerate hard down a long straightaway, braking heavily at the end for a hard corner. You slice smoothly through the esses, and then boldly keep the power on for a fast sweeper. The Ferrari drifts dangerously near the edge, but you make a tiny correction in the steering, and you are through.

The finish line flashes by, and suddenly you are in the pits. The car falls silent. You see your lap times being held up. Your final lap was a new lap record! At last, you permit yourself a small smile.

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FANTASTIC ACTION

Revolution uses high resolution, machine language graphics for action that is smooth and fast. The emphasis is on authenticity in the control and motion of your car. As in driving a real race car, accuracy and precision in your driving are what counts. Frills and non-essentials have been left out.

PURE COMPETITION

Like a real race driver in practice and qualifying sessions, you compete against the clock and against the existing lap record for that track. *Revolution* records the lap records and the name of the person who set the record, so you always know who reigns supreme on your favorite track!

DESIGNED WITH YOU IN MIND

Revolution is menu-driven, and self explanatory. Information screens tell you what you need to know. When you're ready to play, a menu of the names of all your tracks is displayed, along with the lap record for each track and the name of the person who set that lap record. You select a track with a single keystroke, and *Revolution* takes you there.

A NEW CONCEPT

Revolution is a unique game, because it allows you to create the most important part of any race game: the track itself.

The first time you run *Revolution,* you will be able to choose from several tracks and cars which are included with the game.

But, with *Revolution,* this is only the beginning! You can create as many tracks as you like. You can make each new track as difficult or as easy as you wish. You can make easy ones to begin with, and tougher ones as you become more skilled. You may find creating tracks to be almost as much fun as driving on them!

You can save your favorite tracks to run on again whenever you wish. *Revolution* will automatically add these new tracks to the menu. And you can exchange your favorite tracks with other *Revolution* owners.

Be careful, though, about letting your friends play this game. They may not want to let you have your computer back!

THE EARLY *REVOLUTION*

A prototype version of *Revolution* was published in the September, 1982 issue of Rainbow magazine, under the name *The Track.* The response to *The Track* has been terrific.

Revolution has all the features that have made *The Track* a favorite, and *Revolution*'s fast, high-resolution machine language graphics are dramatically improved over the prototype's.

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The original *Revolution* for the TRS-80™ Color Computer requires 32K and one disk drive. A new cassette version has action just like the disk version, and similar track-saving features excluding a menu of available tracks. The cassette version will run on a 32K Color Computer or TDP-100. You can upgrade to the disk version later, too, for a nominal fee.

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Inter Action

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```
1340 NEXT:POKE65494,0:RETURN
1368 '
1369 ' HI-LITE SECTORS
1370 CLS:PRINT:PRINT"   DO YOU W
ANT TO HI-LITE ANY          SEC
TORS (Y/N)?":SOUND140,1:GOSUB20
1380 IFIK$="N"THENRETURN
1390 CLS:POKE65495,0:PRINT:PRINT
"     WHICH SECTORS ?":FORZ=1TO
I-1:PRINT@40+32*Z,Z;:PRINTTAB(10
)F$(Z);TAB(20);:PRINT USING".##"
;P(Z):NEXT
1400 QQ=1
1410 PRINT@455," 'F' WHEN FINISH
ED";
1420 GOSUB20
1430 IFIK$="F"THEN1460
1440 Z=VAL(IK$):PRINT@39+32*Z,">
";:PAINT(A(Z-1),B(Z-1)),PR,PR
1450 QQ=QQ+1:IFQQ<I THEN1420
1460 POKE65494,0:RETURN
1488 '
1489 'DATA SAVE ROUTINE
1490 CLS:INPUT"ENTER DATA FILE N
AME";NF$:IFNF$="Q"THEN RETURN EL
SE NF$=LEFT$(NF$,8):OPEN"O",#1,N
F$
1500 WRITE#1,I,SUMF
1510 FORKK=1TO I-1:WRITE#1,F$(KK
),F(KK):NEXT:CLOSE:RETURN
1538 '
1539 'GRAPH SAVE ROUTINE
1540 CLS:INPUT"GRAPH NAME";FI$:I
FFI$="Q"THEN RETURNELSE FI$=LEFT
$(FI$,8):SCREEN1,0:SAVEMFI$,PEEK
(188)*256,PEEK(188)*256+6143,380
:RETURN
1568 '
1569 'PRINTER ROUTINES
1570 CLS:PRINT"HALF AND FULL WID
TH PAGE COPY   ARE AVAILABLE."
1580 PRINT:PRINT"HALF PAGE COPY
CAN BE LOCATED   RIGHT, LEFT, OR
 CENTER."
1590 PRINT:PRINT"DO YOU WANT hAL
F OR fULL PAGE?":SOUND140,1:GOSU
B20
1600 IFIK$="F"ORIK$="f"THEN GOTO
1630
1610 IFIK$="H"ORIK$="h"AND CC=OT
HEN GOSUB1650 ELSE LOADM"GSPRP":
CC=0:GOSUB1650
1620 SCREEN1,0:IFPPOINT(5,190)=1
THEN P=USR2(XP):GOTO530 ELSE P=U
SR1(XP):GOTO530
1630 IFCC=1THEN 1620
1640 S=&H7D90:POKES+37,2:POKES+4
5,95:POKES+62,4:POKES+67,47:POKE
S+197,48:POKES+277,18:POKES+278,
18:CC=1:XP=-125:GOTO1620
1650 CLS:PRINT"POSITION OF GRAPH
 (L/R/C)":SOUND140,1:GOSUB20:XP$
=IK$
1660 IFXP$="L"THEN XP=-160:RETUR
N
1670 IFXP$="R"THEN XP=125:RETURN
1680 XP=0:RETURN
1690 PCLEAR4:GOTO70
1700 DATA 198,32,182,1,90,142,4,
0,167,128,140,4,31,38,249,142,5,
224,167,128,140,6,0,38,249,142,4
,32,167,132,167,31,58,140,6,0,38
,246,57
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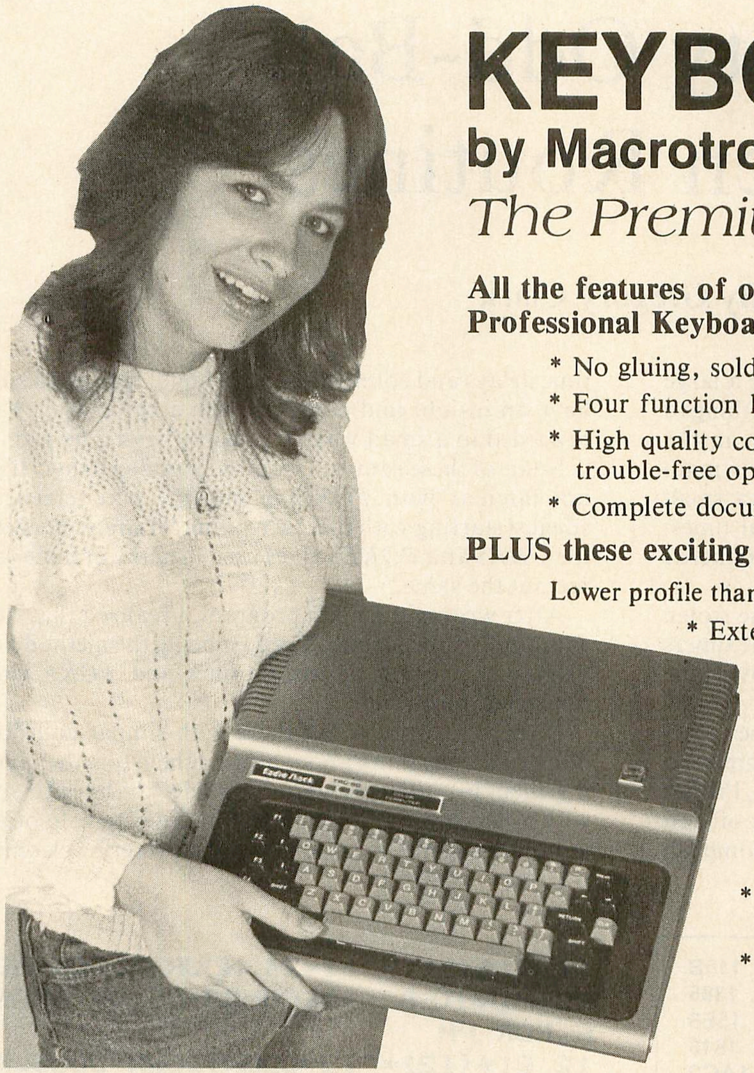

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PROGRAMMING UTILITY **16K ECB**

Twenty Odd-Ball Screen Routines

By Gregory Clark

Have you ever been in the middle of writing a large program and realized that you needed something to fill in a small time delay or a visual gap in the on-screen proceedings? Now you have to put your main program on the back burner and come up with a small subroutine. Well, this has happened to me several times; some of the routines in this program are the result. Others I wrote just to come up with a round number.

There are timers, counters, time-wasters, and one stolen in whole from a very early issue of *the Rainbow*. The timers in themselves are not accurate, it is up to you to provide the timing interval within your own program for that.

They all have one thing in common — they cause something visual to happen on the text screen. Since there is no one way to do things when writing a BASIC program, I'm not claiming that the methods used are the best. I have offered these routines as an example of several ways to accomplish time delays and counting. If you should happen to suddenly have an insight and come up with a better way, I will be rewarded in a small way by possibly having helped.

Some of these routines require Extended BASIC. If you are not familiar with *POKEing* into the text screen, then I suggest starting with the last routine *Strange Characters,* as the *CHR$* and *POKE* values used in many of these routines are not the same.

After writing the main program, I realized that there are actually 21 subroutines. The 21st being the method I used to display the listing of the routines and *POKE* values in *Strange Characters.*

If there are others out there with similar collections of odds and ends, think about putting them together and sending them in to *the Rainbow*. You do not have to come up with a major programming feat in order to help other programmers, sometimes small tidbits are very welcome.

12	01E6
191	04D8
3040	0777
70	09BE
9010	0BD2
11050	0EEB
12060	115B
13085	1385
13200	15E9
16010	1816
18030	1AC2
20030	1E40
END	2108

The listing:

```
1 CLEAR500:DIMQ1$(20):CLS:Q1=1:Q
1$(1)=" 1=1/4 BLOCK-COLOR CHANGE
2 Q1$(2)=" 2=SINGLE DOT/L-R
3 Q1$(3)=" 3=SINGLE BAR/L-R
4 Q1$(4)=" 4=MULTIPLE POINTS-CHA
NGE COLOR
5 Q1$(5)=" 5=RANDOM TIME WASTER
6 Q1$(6)=" 6=MULTIPLE TIME WASTE
R
7 Q1$(7)=" 7=DOUBLE BLOCKS/L-R+R
-L
8 Q1$(8)=" 8=COUNTER/0TO99
9 Q1$(9)=" 9=COUNTER/0TO999
10 Q1$(10)="10=12 HOUR CLOCK-HOU
RS+MINUTES
11 Q1$(11)="11=24 HOUR CLOCK-HOU
RS+MINUTES  +SECONDS+COLOR CHANG
E FOR PM
12 Q1$(12)="12=COUNTDOWN DOUBLE
BAR
13 Q1$(13)="13=CLOCK FACE TIMER
14 Q1$(14)="14=4 BLOCK COLOR CHA
NGE
15 Q1$(15)="15=0-9 NUMERIC-SHIFT
 CHANGE
16 Q1$(16)="16='TIMES SQUARE HEA
DER' STOLEN FROM the RAINBOW VOL
I NO5
17 Q1$(17)="17=COUNTDOWN W/TONES
18 Q1$(18)="18=ACROSS BOTTOM DOU
BLE BAR
19 Q1$(19)="19=1 BLOCK-CORNERS C
HANGE
20 Q1$(20)="20=HIDDEN CHARACTERS
100 AA=1:AB=1024
101 A$="L100AP10AP10DP10CCD":B$=
"L200A"
110 CLS:PRINT@256," TWENTY ODDBA
LL SCREEN ROUTINES":PRINT@465,"B
Y greg clark":FORY=1TO10:PLAYA$:
NEXT
120 CLS:PRINT@224,"CHANGE VALUE
```

(Greg Clark works for New York Telephone Co. and in his spare time enjoys writing Adventure programs. His wife, Ruth, is quietly supportive of the time spent at his hobby.)

```
OF Y IN LINE 200 TOSPEED UP OR S
LOW DOWN EXECUTION          OF E
XAMPLES":FORY=1TO3000:NEXT
190 AA=0:AB=0:AC=0:AD=0:AE=0:AF=
0:AZ=0:FORX=1TO1000:NEXT:CLS:PRI
NT@256,"ENTER # OF CHOICE (99 FO
R LIST) PRESS <E> TO EXIT DURING
 RUN":INPUTXX
191 IFXX=99THENGOTO60000ELSEIFXX
<0 OR XX>20THENPLAY"L10A":GOTO19
0
193 PRINT@352,Q1$(XX)
195 ON XX GOSUB1000,2000,3000,40
00,5000,6000,7000,8000,9000,1000
0,11000,12000,13000,14000,15000,
16000,17000,18000,19000,20000
197 E$=INKEY$:IFE$="E"THEN190
200 FORY=1TO300:NEXT:GOTO195
205 GOTO195
1000 REM 1/4 BLOCK-COLOR CHANGE
1005 IFAZ=0THENAA=136:AZ=1
1010 PLAYB$:POKE1024,AA
1020 AA=AA+16:IFAA>248THENAA=136
:AB=AB+1:IFAB>10THEN1040
1030 RETURN
1040 PLAYA$:CLS:GOTO190
2000 REM SINGLE DOT-MOVES ACROSS
 SCREEN
2001 REM AA,AB
2005 IFAZ=0THENAA=1:AB=1024:AZ=1
2010 PLAYB$:ON AA GOTO2030,2040
2030 POKEAB-1,143:POKEAB,135:AA=
2:RETURN
2040 POKEAB,139:AA=1:AB=AB+1
2050 IFAB>1055THEN2060ELSERETURN
2060 PLAYA$:CLS:GOTO190
3000 REM SINGLE BAR
3001 REM AA,AB
3005 IFAZ=0THENAA=1:AB=1024:AZ=1
3010 PLAYB$:ON AA GOTO3020,3030
3020 POKEAB,135:AA=2:RETURN
3030 POKEAB,131:AB=AB+1:AA=1
3040 IFAB>1055THEN3050ELSERETURN
3050 PLAYA$:CLS:GOTO190
4000 REM MULTIPLE POINTS-CHANGE
COLOR
4005 IFAZ=0THENAA=1:AB=1532:AZ=1
:FORX=1532TO1535:POKEX,191:NEXT
4010 PLAYB$:AC=AC+1:ON AA GOTO40
20,4030,4030,4030
4020 POKEAB+3,191:POKEAB,159:AA=
AA+1:AB=AB+1:RETURN
4030 POKEAB-1,191:POKEAB,159:AA=
AA+1:AB=AB+1
4040 IFAB=1536THENAB=1532:AA=1
4045 IFAC=20THEN190
4050 RETURN
5000 REM RANDOM TIME WASTER
5010 IFAZ=0THENAA=RND(-TIMER):AZ
=1
5020 PLAYB$:AA=RND(128):AA=AA+12
7:POKE1135,AA
5030 AB=AB+1:IFAB=20THEN190
5040 RETURN
6000 REM MULTIPLE TIME WASTER
6010 IFAZ=0THENAA=RND(-TIMER):AZ
=1
6020 AA=RND(128)+127:PLAYB$:AB=A
B+1:ON AB GOTO6030,6040,6050,606
0
6030 POKE1134,AA:RETURN
6040 POKE1135,AA:RETURN
6050 POKE1136,AA:RETURN
6060 AB=0:POKE1137,AA
6070 AC=AC+1:IFAC=5THEN190
6080 RETURN
7000 REM DOUBLE BLOCKS/L-R+R-L
7010 IFAZ=0THENAA=1:AB=1504:AC=1
535:AD=159:AF=1:AZ=1
7020 PLAY"L100"+C$:POKEAB,AD:POK
EAC,AD
7030 AB=AB+1:AC=AC-1
7040 IFAB=1520THENAD=AD+16:AE=AE
+1:AF=AF+1
7050 IFAB=1536THENAB=1504:AD=AD+
16:AF=AF+1:AC=1535
7060 IFAD>252THENAD=159
7065 IFAF=8THENAF=1
7070 IFAE>10THEN190
7075 C$=STR$(AF):C$=";"+C$
7080 RETURN
8000 REM COUNTER/0TO99
8010 IFAZ=0THENFORX=1128TO1131:P
OKEX,239:NEXT:AA=48:AB=48:AZ=1
8015 PLAYB$:POKE1129,AA:POKE1130
,AB
8020 AB=AB+1:IFAB=58THENAB=48:AA
=AA+1
8030 IFAA=58ANDAB=48THENPLAYA$:G
OTO190
8040 RETURN
9000 REM COUNTER/0TO999
9010 IFAZ=0THENPOKE1086,175:POKE
1214,175:AA=112:AB=112:AC=112:AZ
=1
9020 PLAYB$:POKE1118,AA:POKE1150
,AB:POKE1182,AC
9030 IFAA=121ANDAB=121ANDAC=121T
HENPLAYA$:GOTO10
9040 AC=AC+1:IFAC=122THENAC=112:
AB=AB+1:IFAB=122THENAB=112:AA=AA
+1
9050 RETURN
10000 REM 12 HOUR CLOCK-HOURS+MI
NUTES
10010 IFAZ=0THENPOKE1484,159:POK
E1487,122:POKE1490,159:AA=112:AB
=112:AC=112:AD=112:AZ=1
10020 PLAYB$:POKE1485,AA:POKE148
6,AB:POKE1488,AC:POKE1489,AD
```

```
10030 IFAA=113ANDAB=114THENPLAYA
$:GOTO190
10040 AD=AD+1:IFAD=122THENAD=112
:AC=AC+1:IFAC=118THENAC=112:AB=A
B+1:IFAB=122THENAB=112:AA=AA+1
10050 RETURN
11000 REM 24 HOUR CLOCK-HOURS+MI
NUTES+SECONDS+COLOR CHANGE FOR P
M
11010 IFAZ=0THENPOKE1024,223:POK
E1027,122:POKE1030,122:POKE1033,
223:AA=112:AB=112:AC=112:AD=112:
AE=112:AF=112:AZ=1
11015 IFAG=1THEN11100
11020 POKE1025,AA:POKE1026,AB:PO
KE1028,AC:POKE1029,AD:POKE1031,A
E:POKE1032,AF
11030 IFAA=113ANDAB=114THENAG=1:
RETURN
11040 AF=AF+1:IFAF=122THENAF=112
:AE=AE+1:IFAE=118THENAE=112:AD=A
D+1:IFAD=122THENAD=112:AC=AC+1:I
FAC=118THENAC=112:AB=AB+1:IFAB=1
22THENAB=112:AA+AA+1
11050 RETURN
11100 IFAZ=1THENAA=49:AB=50:AC=4
8:AD=48:AE=48:AF=49:POKE1027,58:
POKE1030,58:AZ=2
11110 POKE1025,AA:POKE1026,AB:PO
KE1028,AC:POKE1029,AD:POKE1031,A
E:POKE1032,AF
11120 IFAA=50ANDAB=52THENPLAYA$:
GOTO190
11130 AF=AF+1:IFAF=58THENAF=48:A
E=AE+1:IFAE=54THENAE=48:AD=AD+1:
IFAD=58THENAD=48:AC=AC+1:IFAC=54
THENAC=48:AB=AB+1:IFAB=58THENAB=
48:AA=AA+1
11140 RETURN
12000 REM COUNTDOWN DOUBLE BAR
12010 IFAZ=0THENFORX=1120TO1151:
POKEX,179:NEXT:AA=1151:AB=1151:P
OKE1151,191:AZ=1
12020 AE=PEEK(AA):AA=AA-1:AC=PEE
K(AA)
12025 IFAA=1119THENAD=PEEK(1120)
:IFAD=191THENAA=1151:POKE1120,17
9:POKEAB,176:AB=AB-1:POKEAA,188:
PLAYB$:RETURN
12030 IFAC=179THENPOKEAA,191:IFA
E=188THENPOKEAA+1,176ELSEPOKEAA+
1,179
12040 IFAC=176THENPOKEAA,188:IFA
E=188THENPOKEAA+1,176ELSEPOKEAA+
1,179
12050 IFAA=1120ANDAC=176THENPOKE
1120,176:PLAYA$:GOTO190
12060 RETURN
13000 REM CLOCK FACE TIMER
13010 IFAZ=0THENFORX=1024TO1039:
FORY=0TO7:POKEX+(Y*32),128:NEXTY
,X:AA=1032:AB=1:AZ=1:POKE1127,22
5:POKE1128,226:POKE1159,228:POKE
1160,232:POKE1063,172:POKE1064,1
72
13014 PLAYB$
13015 ON AB GOTO13020,13040,1305
0,13060,13070,13080
13020 POKEAA,220:POKEAA-1,128:AA
=AA+1
13025 IFAA=1040THENAB=2:AA=1039
13030 IFAA=1032THEN13090
13035 RETURN
13040 POKEAA,211:AA=AA+32:AB=3
13045 RETURN
13050 POKEAA,220:POKEAA-32,128:A
B=2
13055 IFAA=1263THENAB=4
13057 RETURN
13060 POKEAA,211:IFAC=0THENAB=4:
AA=AA-1:AC=1:ELSEPOKEAA+1,128:AB
=4:AA=AA-1
13065 IFAA=1247THENAA=1248:AB=5
13067 RETURN
13070 POKEAA,220:AA=AA-32:AB=6
13072 IFAA=992THENAA=1025:AB=1
13075 RETURN
13080 POKEAA,211:POKEAA+32,128:A
B=5
13085 RETURN
13090 PLAY"L90D-
```

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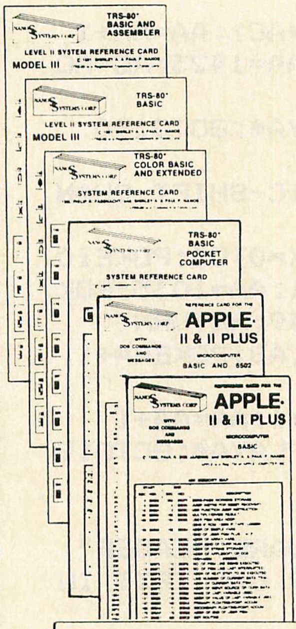
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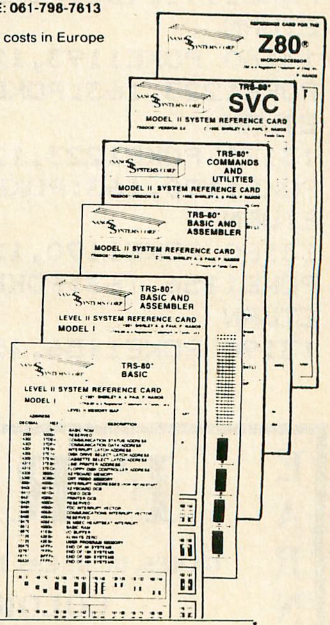
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```
13100 AC=0:ON AD GOTO13110,13120
,13130,13140,13150,13160,13170,1
3180,13190,13200,13210,13220
13110 POKE1063,128:POKE1064,128:
POKE1097,172:POKE1066,163:AD=2:R
ETURN
13120 POKE1097,128:POKE1066,128:
POKE1131,172:POKE1100,163:AD=3:R
ETURN
13130 POKE1131,128:POKE1100,128:
POKE1133,163:POKE1165,172:AD=4:R
ETURN
13140 POKE1133,128:POKE1165,128:
POKE1163,163:POKE1196,172:AD=5:R
ETURN
13150 POKE1163,128:POKE1196,128:
POKE1193,163:POKE1226,172:AD=6:R
ETURN
13160 POKE1193,128:POKE1226,128:
POKE1223,163:POKE1224,163:AD=7:R
ETURN
13170 POKE1223,128:POKE1224,128:
POKE1190,163:POKE1221,172:AD=8:R
ETURN
13180 POKE1190,128:POKE1221,128:
POKE1156,163:POKE1187,172:AD=9:R
ETURN
13190 POKE1156,128:POKE1187,128:
POKE1122,163:POKE1154,172:AD=10:
RETURN
13200 POKE1122,128:POKE1154,128:
POKE1091,163:POKE1124,172:AD=11:
RETURN
13210 POKE1091,128:POKE1124,128:
POKE1061,163:POKE1094,172:AD=12:
RETURN
13220 POKE1061,128:POKE1094,128:
POKE1063,172:POKE1064,172:PLAYA$
:GOTO190
14000 REM 4 BLOCK COLOR CHANGE
14010 IFAZ=0THENCLS0:POKE1423,13
2:POKE1424,132:POKE1425,132:POKE
1426,132:AA=1423:AB=148:AZ=1:RET
URN
14015 PLAY B$
14020 POKEAA,AB+(16*AC):AA=AA+1
14030 IFAA=1427THENAA=1423:AC=AC
+1
14040 IFAC=7THENPLAYA$:GOTO190
14050 RETURN
15000 REM 0-9 NUMERIC-SHIFT CHAN
GE
15010 IFAZ=0THENFORX=0TO9:POKE10
35+X,112+X:NEXT:AZ=1:AA=1035:POK
E1035,48:AB=112:AC=49:RETURN
15020 PLAYB$:POKEAA,AB:POKEAA+1,
AC
15030 AC=AC+1:AB=AB+1:AA=AA+1
15040 IFAA=1044THENPLAYA$:GOTO19
0
15050 RETURN
16000 REM "TIMES SQUARE HEADER"
16005 REM ENTER YOUR OWN TEXT IN
PLACE OF RB$
16010 CLS0
16020 RB$="                ------------
--THIS PROGRAM APPEARED IN 'the
RAINBOW' VOLUME I NO 5 (TOTAL PA
GES=20 INCLUDING COVERS). I HAVE
 NEVER SEEN IT RE-PRINTED ANYWHE
RE AND INCLUDE IT HERE FOR THE N
EWER 'RAINBOW' READERS----------
-----"+STRING$(16,32)
16030 FORAA=1 TO LEN(RB$)-15:AB=
AB+1:IFAB>4 THEN AB=1:E=1125:EE=
1140
16040 PRINT@328,MID$(RB$,AA,15);
16050 SOUND RND(240),1:NEXTAA
16060 GOTO190
17000 REM COUNTDOWN W/TONES
17010 IFAZ=0THENFOR AD=1055TO153
5STEP32:POKEAD,239:NEXTAD:AA=105
5:POKEAA,227:AB=1:SOUNDAB,1:AC=1
:AZ=1:RETURN
17015 AB=AB+7:IFAA=1567 THENPLAY
A$:GOTO190
17020 ON AC GOTO 17030,17040
17030 POKEAA,140:SOUNDAB,1:AC=2:
```

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```
AA=AA+32:RETURN
17040 POKEAA,227:POKEAA-32,143:S
OUNDAB,1:AC=1:RETURN
18000 REM ACROSS BOTTOM-DOUBLE B
AR/AC=1/AB=1504
18010 IFAZ=0THENAC=1:AB=1504:AZ=
1
18020 REM AA,AB,AC
18030 IFAA=0THEN18100
18040 PLAYB$:ON AC GOTO18050,180
60,18070,18080
18050 POKEAB,247:AC=AC+1:RETURN
18060 POKEAB,245:AC=AC+1:RETURN
18070 POKEAB,241:AC=AC+1:RETURN
18080 POKEAB,240:AC=1:AB=AB+1
18090 IFAB=1536THEN18110ELSERETU
RN
18100 FORX=1504TO1535:POKEX,255:
NEXT:AA=1:GOTO18040
18110 PLAYA$:CLS:GOTO190
19000 REM 1 BLOCK - CORNERS CHAN
GE/AA=1
19010 IFAZ=0THENAA=1:AZ=1
19020 PLAYB$:ON AA GOTO19030,190
40,19050,19060
19030 POKE1024,216:AA=AA+1:RETUR
N
19040 POKE1024,228:AA=AA+1:RETUR
N
```

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```
19050 POKE1024,242:AA=AA+1:RETUR
N
19060 POKE1024,193:AA=1:AB=AB+1
19070 IFAB>10THEN19080ELSERETURN
19080 PLAYA$:CLS:GOTO190
20000 REM HIDDEN CHARACTERS
20010 W1=0:CLS:PRINT@32,"THERE A
RE SOME INTERESTING CHAR-  ACTER
S HIDDEN IN YOUR COCO":FORAA=1TO
2000:NEXT:PRINT@128,"USING THE C
HR$( ) FORMAT YOU CANUSE THOSE C
HARACTERS SHOWN IN   THE RADIO S
HACK MANUALS,BUT HAVEYOU SEEN TH
ESE?"
20020 AB=27:FORX=1440TO1471:POKE
X,AB:AB=AB+1:NEXT:FORX=1TO6000:N
EXT
20030 CLS:PRINT@128,"THESE CHARA
CTERS ARE AVAILABLE  USING POKES
 TO THE SCREEN MEMORYLOCATIONS 1
024-1535. PRINT@0,"CHR$(34)"a"CH
R$(34)"OR PRINT@0,CHR$(97) IS TH
E SAME AS POKE1024,1"
20040 FORX=1TO6000:NEXT:CLS:PRIN
T"THE FORMAT IS POKEXXX,YYY. XXX
X=DIGIT BETWEEN 1024 AND 1535 AN
D YYY=DIGIT BETWEEN 0 AND 255"
20050 PRINT"USE UP AND DOWN ARRO
WS TO MOVE  THE DISPLAY. ENTER <
E> TO EXIT"
20055 W1=0:PRINT@352,"POKE1392,"
W1"=":POKE1392,W1
20060 W1$=INKEY$:IFW1$=""THEN200
60
20070 IFW1$="E"THEN190
20075 IFW1$<>"^" AND W1$<>CHR$(1
0)THENSOUND10,1:GOTO20060
20080 IFW1$="^"THENW1=W1+1:IFW1>
255THENW1=0
20090 IFW1$=CHR$(10)THENW1=W1-1:
IFW1<0THENW1=255
20100 PRINT@352,"POKE1392,"W1"="
:POKE1392,W1:GOTO20060
20999 FORX=1TO2000:NEXT:GOTO190
60000 REM LIST
60005 Q1=1:CLS:PRINT"USE UP AND
DOWN ARROWS TO LOOK  AT LIST-PRE
SS <E> TO EXIT":PRINTQ1$(1)
60010 Q1$=INKEY$:IFQ1$=""THEN600
10
60013 IFQ1$="E"THEN190
60015 IFQ1$<>"^" AND Q1$<>CHR$(1
0)THENSOUND10,1:GOTO60010
60020 IFQ1$=CHR$(10)THENQ1=Q1-1:
IFQ1<1THENQ1=20
60030 IFQ1$="^"THENQ1=Q1+1:IFQ1>
20THENQ1=1
60040 PRINT:PRINTQ1$(Q1):GOTO600
10
```

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Four For Fun

By Paul Wesley Myers

Being the father of two pre-schoolers, one of the first undertakings I attempted on my 4K CoCo was to get the kids involved. After all, telling my wife it was for the kids was the only way I could justify its purchase in the first place. The first two programs listed here are written for the 4K, non-Extended BASIC CoCo. The third, a light entertainment program requires 16K, non-Extended BASIC. With some little work, it could be cut down to fit on a 4K machine also. The last program needs 16K Extended BASIC. Please forgive the rather rag-tag lettering used in it, it was my first attempt at high-resolution graphics.

The first program, called *Key-Fun*, is just that. It is designed to be an ice-breaker to the computer. The program draws a clown's face on the screen, then puts a letter on the clown's nose. If the child presses the letter that matches it on the keyboard, the clown smiles and he/she hears an assending sound. Even for the child who doesn't know the alphabet yet, it's a chance to get in on the fun.

The second program is a little more advanced, and requires the child to have a little knowledge of the alphabet. All of the letters are shown on the screen, and then one is "blacked out." If the child presses the correct "missing letter", a short rendition of "Pop Goes The Weasle" plays, and another letter is darkened. When my oldest daughter started to play with this one, and she didn't know the answer right off, she'd break into a chorus of "ABCD . . ." It works as a great reinforcer.

The third program was written as a little entertainment break. *Song-Time* is a collection of four well-known children's tunes. By pressing A, B, C or D, the child selects a song to be played. The program serves as a nice pause when the child begins to tire of the other programs. It's great fun. After all, he/she gets to make the music.

The last program in the group, *Shapes And Colors* will require a little adult help at first. Four shapes of different colors will be drawn on the right of the screen. Then on the left of the screen, a question will be asked such as "Which is blue?" or "Which is a circle?" At first, an adult will be needed to read the question to the child. But don't fret too much over this. You will be very surprised at how fast the kids will learn to recognize these words.

(Paul Myers is a programming analyst for Technicon Corporation. His eight years of data processing experience include working with both large-scale and minicomputers.)

All four of these programs use the keyboard as the input device. I've tried using the joysticks in some other programs, but have had only mixed success with them. What I'm really hoping to see on the market soon is a touch-sensitive overlay for a 13" screen that could be attached through one of the joystick ports. To all you designers out there, here's a great educational tool I hope you don't pass over.

Listing 1:

280 . . . . 01B5
540 0339
END . . . 048A

```
10 ' KEYBOARD FUN
20 ' PAUL W. MYERS
30 ' 10/8/83
40 CLS5
50 ' DRAW NOSE
60 FOR X=10 TO 15
70 FOR Y=28 TO 33
80 SET(Y,X,1)
90 NEXT Y,X
100 ' DRAW MOUTH
110 FOR X=20 TO 41
120 FOR Y=20 TO 21
130 SET(X,Y,4)
140 NEXT Y,X
150 ' DRAW RIGHT EYE
160 FOR X=20 TO 23
170 FOR Y=4 TO 7
180 SET(X,Y,3)
190 NEXT Y,X
200 ' DRAW LEFT EYE
210 FOR X=38 TO 41
220 FOR Y=4 TO 7
230 SET(X,Y,3)
240 NEXT Y,X
250 ' SELECT LETTER
260 V=RND(26)
270 L$=CHR$(V+64)
280 ' PRINT LETTER ON NOSE
290 PRINT @ 207,L$;
300 Z$=INKEY$
310 IF Z$="" THEN 300
320 IF Z$<> L$ THEN 570
330 ' RIGHT ANSWER
```

```
340 ' DRAW SMILE
350 FOR X=20 TO 21
360 FOR Y=18 TO 19
370 SET(X,Y,4)
380 NEXT Y,X
390 FOR X=40 TO 41
400 FOR Y=18 TO 19
410 SET(X,Y,4)
420 NEXT Y,X
430 FOR S=100 TO 200 STEP 5
440 SOUND S,1:NEXT S
450 ' ERASE SMILE
460 FOR X=20 TO 21
470 FOR Y=18 TO 19
480 SET(X,Y,5)
490 NEXT Y,X
500 FOR X=40 TO 41
510 FOR Y=18 TO 19
520 SET(X,Y,5)
530 NEXT Y,X
540 GOTO 260
550 ' WRONG ANSWER
560 ' DRAW FROWN
570 FOR X=20 TO 21
580 FOR Y=22 TO 23
590 SET(X,Y,4)
600 NEXT Y,X
610 FOR X=40 TO 41
620 FOR Y=22 TO 23
630 SET(X,Y,4)
640 NEXT Y,X
650 FOR S=1 TO 10
660 SOUND 1,2
670 FOR B=1 TO 5
680 NEXT B,S
690 ' ERASE FROWN
700 FOR X=20 TO 21
710 FOR Y=22 TO 23
720 SET(X,Y,5)
730 NEXT Y,X
740 FOR X=40 TO 41
750 FOR Y=22 TO 23
760 SET(X,Y,5)
770 NEXT Y,X
780 GOTO 300
```

```
220.....017C
END ... 0320
```

Listing 2:

```
10 ' MISSING LETTER
20 ' PAUL W. MYERS
30 ' 10/8/83
40 CLS4
50 PRINT @ 4,"WHAT LETTER IS MIS
SING ?";
60 DIM B(26) ' SAVES LOCATION OF
 LETTERS
70 ' DRAW BOARD
80 A=65
90 Z=67
100 FOR X=1 TO 5 ' ROWS
110 FOR Y=1 TO 6 ' COLUMNS
120 A$=CHR$(A)
130 PRINT @ Z,A$;
140 PRINT @ Z+1,CHR$(138);
150 A=A+1
160 C=C+1
170 B(C)=Z
180 ' FINISHED ?
190 IF C=26 THEN 270
200 ' NEXT COLUMN
210 Z=Z+5
220 NEXT Y
230 ' NEXT ROW
240 Z=Z+34
250 NEXT X
260 ' SELECT LETTER TO HIDE
270 R=RND(26)
280 PRINT @ B(R),CHR$(128);
290 PRINT @ B(R)+1,CHR$(133+48);
300 PRINT @ 420,"PRESS THE MISSI
NG LETTER";
310 L$=INKEY$
320 IF L$="" THEN 310
330 IF L$=CHR$(64+R) THEN 400
340 ' WRONG ANSWER
350 FOR X=1 TO 3
360 SOUND 110,7:SOUND 1,7
370 NEXT X
380 GOTO 310
390 ' RIGHT ANSWER
400 PRINT @ B(R),L$;
410 PRINT @ B(R)+1,CHR$(138);
420 SOUND 147,5
430 SOUND 108,4
440 SOUND 133,1
450 SOUND 125,5
460 SOUND 89,5
470 GOTO 270
```

```
120.....0122
280.....0309
460.....057D
END ... 0766
```

Listing 3:

```
10 ' SONG-TIME
20 ' PAUL W. MYERS
30 ' 10/8/83
40 CLEAR 20
50 CLS3
60 DIM A(84),B(52),C(64),D(64)
70 FOR X= 1 TO 84
80 READ A(X):NEXT
90 ' TWINKLE TWINKLE
100 DATA 89,8,89,8,147,8,147,8,1
59,8,159,8
110 DATA 147,16,133,8,133,8,125,
8,125,8,108,8,108,8
120 DATA 89,16,147,8,147,8,133,8
,133,8,125,8,125,8
130 DATA 108,16,147,8,147,8,133,
8,133,8,125,8,125,8
140 DATA 108,16,89,8,89,8,147,8,
147,8,159,8,159,8
```

```
150 DATA 147,16,133,8,133,8,125,
8,125,8,108,8,108,8
160 DATA 89,16
170 FOR X=1 TO 52
180 READ B(X):NEXT
190 ' JINGLE BELLS
200 DATA 125,4,125,4,125,8,125,4
,125,4,125,8
210 DATA 125,4,147,4,89,6,108,2,
125,8,255,8
220 DATA 133,4,133,4,133,6,133,2
,133,4,125,4
230 DATA 125,4,125,2,125,2,147,8
,147,8,133,8
240 DATA 108,8,89,32
250 FOR X=1 TO 64
260 READ C(X):NEXT
270 ' ARE YOU SLEEPING
280 DATA 89,8,108,8,125,8,89,8,8
9,8,108,8,125,8
290 DATA 89,8,125,8,133,8,147,16
,125,8,133,8,147,16
300 DATA 147,4,159,4,147,4,133,4
,125,8,89,8
310 DATA 147,4,159,4,147,4,133,4
,125,8,89,8
320 DATA 89,8,147,8,89,16,89,8,1
47,8,89,16
330 FOR X=1 TO 64
```

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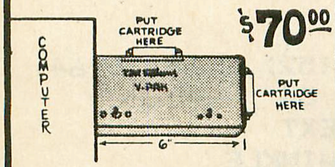

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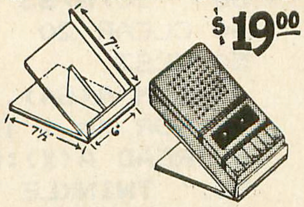

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```
340 READ D(X):NEXT
350 ' THIS OLD MAN
360 DATA 147,4,125,4,147,8,147,4
,125,4,147,8
370 DATA 159,4,147,4,133,4,125,4
,108,4,125,4,133,4
380 DATA 125,2,133,2,147,4,89,4,
89,2,89,2,89,4
390 DATA 89,2,108,2,125,2,133,2,
147,8
400 DATA 147,4,108,4,108,4,133,4
,125,4,108,4
410 DATA 89,8
420 PRINT @ 1,"WHAT SONG DO YOU
WANT TO HEAR?";
430 PRINT @ 96,"A = TWINKLE TWIN
KLE LITTLE STAR"
440 PRINT @ 160,"B = JINGLE BELL
S"
450 PRINT @ 224,"C = ARE YOU SLE
EPING"
460 PRINT @ 288,"D = THIS OLD MA
N"
470 X$=INKEY$
480 IF X$="" THEN GOTO 470
490 IF X$="A" THEN GOTO 550
500 IF X$="B" THEN GOTO 610
510 IF X$="C" THEN GOTO 670
520 IF X$="D" THEN GOTO 730
530 GOTO 470
540 ' TWINKLE TWINKLE
550 FOR X=1 TO 84 STEP 2
560 S=A(X):D=A(X+1)
570 SOUND S,D
580 NEXT X
590 GOTO 470
600 ' JINGLE BELLS
610 FOR X=1 TO 52 STEP 2
620 S=B(X):D=B(X+1)
630 SOUND S,D
640 NEXT X
650 GOTO 470
660 ' ARE YOU SLEEPING
670 FOR X=1 TO 64 STEP 2
680 S=C(X):D=C(X+1)
690 SOUND S,D
700 NEXT X
710 GOTO 470
720 ' THIS OLD MAN
730 FOR X=1 TO 64 STEP 2
740 S=D(X):D=D(X+1)
750 SOUND S,D
760 NEXT X
770 GOTO 470
```

```
190 ..... 016B
450 ..... 0478
640 ..... 066D
END .. 09DB
```

Listing 4:

```
10 ' SHAPES AND COLORS
20 ' PAUL W. MYERS
```

```
30 ' 10/8/83
40 CLEAR 300
50 DIM A$(8)
60 GOSUB 610
70 PMODE 3,1
80 SCREEN 1,0
90 PCLS0
100 ' DRAW GREEN CIRCLE
110 CIRCLE (180,25),20,1
120 PAINT (180,25),1
130 ' DRAW YELLOW SQUARE
140 DRAW "BM163,55;C2;R35;D29;L3
5;U29"
150 PAINT (170,65),2
160 ' DRAW BLUE TRIANGLE
170 DRAW "BM163,120;C3;R36;H18;G
18"
180 PAINT (170,119),3
190 ' DRAW RECTANGLE
200 DRAW "BM150,138;C1;R60;D30;L
60;U30"
210 ' DRAW NUMBER ONE
220 DRAW "BM235,15;D20"
230 ' DRAW NUMBER TWO
240 DRAW "BM230,60;R10;D10;L10;D
10;R10"
250 ' DRAW NUMBER THREE
```

```
260 DRAW "BM230,100;R10;D10;NL5;
D10;L10"
270 ' DRAW NUMBER FOUR
280 DRAW "BM230,145;D10;R10;NU10
;D10"
290 ' "WHICH IS"
300 DRAW "BM20,70;D10;E5;F5;U10;
BR5;D10;U5;R5;U5;D10;BR5;U10;BR5
;NR5;D10;R5;BR5;U10;D5;R5;NU5;D5
;BR15;U10;BR5;NR5;D5;R5;D5;L5"
310 X=RND(8)
320 IF X=Y THEN 310
330 IF X>4 THEN DRAW "BM100,80;U
8;E2;R1;F2;D3;NL5;D5;" ' "A"
340 DRAW "BM20,100;"+A$(X)
350 DRAW "BM120,100;U1;BU3;U2;R2
;U5;L5;D2;"
360 B$=INKEY$
370 IF B$="" THEN 360
380 IF X=1 AND B$="4" THEN 500
390 IF X=2 AND B$="3" THEN 500
400 IF X=3 AND B$="1" THEN 500
410 IF X=4 AND B$="2" THEN 500
420 IF X=5 AND B$="2" THEN 500
430 IF X=6 AND B$="4" THEN 500
440 IF X=7 AND B$="1" THEN 500
450 IF X=8 AND B$="3" THEN 500
```

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```
460 ' WRONG ANSWER
470 SOUND 20,20
480 GOTO 360
490 ' RIGHT ANSWER
500 FOR Z=150 TO 200 STEP 10
510 SOUND Z,1
520 NEXT Z
530 ' DRAW SUBJECT
540 DRAW "BM20,100;C4;"+A$(X)
550 ' DRAW QUESTION MARK
560 DRAW "BM100,80;U8;E2;R1;F2;D
3;NL5;D5;"
570 DRAW "C1;"
580 Y=X
590 GOTO 310
600 ' "PURPLE"
610 A$(1)="U10;R5;D5;L5;BR10;BU5
;D10;R5;U10;BR5;ND10;R5;D5;L5;F5
;BR5;U10;R5;D5;L5;BR10;BU5;D10;R
5;BR5;NR5;U5;NR5;U5;R5"
620 ' "BLUE"
630 A$(2)="U10;R3;F2;D3;NL5;D3;G
2;NL3;BR7;NU10;R5;BR5;NU10;R5;U1
0;BR5;NR5;D5;NR5;D5;R5"
640 ' "GREEN"
650 A$(3)="U10;R5;BD5;NL1;D5;NL5
;BR5;U10;R5;D5;L5;F5;BR5;NR5;U5;
NR5;U5;R5;BR5;NR5;D5;NR5;D5;R5;B
R5;U10;F10;U10"
660 ' "YELLOW"
670 A$(4)="BU10;F5;NE5;D5;BR7;NR
5;U5;NR5;U5;R5;BR5;D10;R5;BR5;NU
10;R5;BR5;U10;R5;D10;NL5;BR5;NU1
0;E5;F5;U10"
680 ' "SQUARE"
690 A$(5)="R5;U5;L5;U5;R5;BR5;ND
10;R5;D10;NL5;NH2;BR5;NU10;R5;NU
10;BR5;U8;E2;R1;F2;D3;NL5;D5;BR5
;U10;R5;D5;L5;F5;BR5;NR5;U5;NR5;
U5;R5;"
700 ' "RECTANGLE"
710 A$(6)="U10;R5;D5;L5;F5;BR5;N
R5;U5;NR5;U5;R5;BR5;D10;NR5;BU10
;R5;BR5;R5;BL3;D10;BR8;U8;E2;R1;
F2;D3;NL5;D5;BR5;U10;F10;U10;BR5
;NR5;D10;R5;NU5;BR5;NU10;R5;BR5;
NR5;U5;NR5;U5;R5;"
720 ' "CIRCLE"
730 A$(7)="NR5;U10;R5;BR5;D10;BR
5;U10;R5;D5;L5;F5;BR5;NR5;U10;R5
;BR5;D10;R5;BR5;NR5;U5;NR5;U5;R5
;"
740 ' "TRIANGLE"
750 A$(8)="BU10;R5;BL3;D10;BR8;U
10;R5;D5;L5;F5;BR5;NU10;BR5;U8;E
2;R1;F2;D3;NL5;D5;BR5;U10;F10;U1
0;BR5;NR5;D10;R5;NU5;BR5;NU10;R5
;BR5;NR5;U5;NR5;U5;R5;"
760 RETURN
```

Welcome to BASIC

By Richard A. White
Rainbow Contributing Editor

Okay, all of you who have been reading "Bits and Bytes" for three, six or even 12 months be advised I am speaking to new owners in this issue. The January *Rainbow* has, with good reason, been dubbed the beginner's issue. Computers sell as gift items at Christmas. We would hope that a few of these new owners will find the *Rainbow* on a newsstand and be reading this now. And with the warm weather over in the northern climates and school well underway everywhere, people move to indoor activities which may include purchase of a personal computer. So, better to include all who have had their CoCos only a few months in my target audience.

Owning a complex machine like a computer is both an exciting and a frustrating experience. Even the simplest program that works gives the new owner a feeling of power and accomplishment. The frustration comes in trying to do something that you should be able to do if you only knew how. Of course, your way is easier than mine was three years ago in that you can shop through nearly two hundred pages of advertising in *the Rainbow* for programs and hardware. I had a 4Kmachine, a Radio Shack manual, and little else. And the manual was not complete. Information on data files and much of the machine language information in the current Color BASIC Manual was not included. Needless to say, I spent some time and gasoline to find some books and magazines that told me enough about other computers that I could make my CoCo do what I wanted. And I sat at the keyboard and tried things.

When you or I type at the keyboard, we are trying to talk to our computer in a language call BASIC. A beginner trying to talk to a computer is like a baby trying to talk to its parents, yet different. The child makes sounds and looks for a response. You type characters and look for a response. If you type the wrong thing you will get an error response which is a colder thing than the child will get, but it still carries information that you will store away to use later. What is this language that you are trying to type?

The BASIC language was devised as an instructional language at Dartmouth College in the mid '60s. It differed from other languages and still differs in that it is interpreted and uses memory in an economical manner. Education has never been rich and memory then was expensive. BASIC is what is called a high level language. In a high level language, you program using words and equations which are similar to the language you talk and write or were taught in math classes. Yes, there are differences from English or algebra and there are specific rules which will be new to you and which must be followed. Still, a high level language is much easier to learn and use than the numbers which the microprocessor understands.

A programming language is a program that converts statements that people can understand to numbers that the microprocessor in the computer can understand. The language does other things for you like storing and recovering data. If you have a program to help balance your checkbook, you probably enter the starting balance, check numbers, dates and amounts and the computer calculates your balance as you go. How does the computer keep track of all this information you have given it? It stores the data in memory either in an area called the variable table, if the data is a number, or in an area called string space, if the data is a series of characters like a name or a date. Each piece of data is assigned to a variable name by your BASIC program and the BASIC Interpreter program handles things from there.

If BASIC is a high level language, what is a low level language? Your 6809 microprocessor understands numbers which tell it to do certain tasks. Two- and three-letter abbreviations called mnemonics have been associated with these number commands. These can be used to write an "assembly language" program that is run through an assembler program to produce machine language, the numbers that the microprocessor understands. Assembly is a low-level language where the programmer tells the micro step by step what to do, like where to go to get data bytes, what to do to these bytes and what to do with the results. The assembly language programmer must know far more about his machine than does the BASIC programmer. A machine language program produces very fast operation coupled with economical memory usage.

There are many high level languages other than BASIC. Typically these languages will "compile" the program to machine language. This process is similar to assembly, but is far more complex. In both cases the program text must be converted by another program before it can be run in the computer.

Since you have BASIC in your CoCo, it is the natural first language to learn. The manuals that come with your machine are very good at teaching basic BASIC. This includes the syntax and a few uses for each of the statements, commands, functions, operators and special features of the language. But, manuals cannot teach all the ways BASIC can

---

(Richard White has a long background with microcomputers and specializes in BASIC programming. With Don Dollberg, he is the author of the TIMS data base management program.)

be used to solve programming problems. Unless execution speed is crucial, BASIC will handle a surprising number of your program needs.

The techniques necessary to do some things are not always apparent. The beginner will quickly understand storing numbers in variables. Storing numbers in strings of characters is not an immediately obvious thing to do, though major savings in memory space with only modest loss of speed can be realized. In most cases, techniques like this are not learned from manuals, but from study of programs written by others. Typing programs in from *the Rainbow* is a fine way to learn these techniques and to become more comfortable with BASIC. You cannot type in a program without thinking about what you are typing and as you think, you learn. In articles like "Bits and Bytes," writers seek to present approaches that they have found successful from their experiences. The focus is on ways to program rather than details of syntax though these will be covered in passing. Some of these ways are very personal in that the programmer has been comfortable with a particular approach to a particular type of problem and will recommend that approach over others. A case in point is my dislike for *DATA* statements where the data is going to be read into variables in the program.

One of the first things to talk about is program organization. In the manuals and in many programs, the approach is very straightforward. Start with Line 10 and number lines at 10-line intervals until you reach the end of the program. This is fine for simple, top to bottom programs like the simpler ones in the manuals.

As you get into more complex programs with a number of functions and subroutines that you develop at different, times confusion can develop easily. Code may not work and need changing, added lines may need to be interspersed and that pretty 10-line spacing is lost. If you RENUMber, the code in higher line numbers is relocated and you have to search for it when you want to work on it again. There are better ways and I laid out my way a year ago when we started "Bits and Bytes." With so many new readers, I will give it again.

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Perhaps the secret to programming is to "divide and conquer." Perhaps? Nay, it's a certainty. If you think of your programs as functional little pieces you will do a lot better. Pascal, another programming language, was written for use in teaching programmers to structure their programs. In fact, you cannot write in Pascal without adhering to strict structural rules. In BASIC, you have a choice of writing free spirited spaghetti-like programs or relatively structured ones.

Reading a "spaghetti" program is rather like reading an upside down roadmap under a new moon at midnight. New programmers seldom know where they are going with a program and, halfway through, may get bogged down figuring where they have been as well. Such is part of the learning process, so don't lose heart.

Program structure means program organization. Some languages require that variables, files, data structures and other attributes be declared at the beginning. Generous use of REMarks is encouraged and specific indentation formats are strongly suggested. Structuring also deals with what should be in subroutines, what should be in the main proceedure and how the procedures flow. Much of this is optional in BASIC; some is just good practice in any language.

Clarity should be as important a goal in BASIC as it is in other languages. There are a number of ways to write clear programs. I use the procedures that follow and find them valuable.

1) Define specific program functions and put the code for each function in its own module with introductory *REMs.* Assign a specific set of lines to a module. Blocks of 100 lines are convenient and will meet most needs. You will always know a module begins at an even hundred and can go right to the one you want.

2) Minimize looping back. The procedure should flow from start to end and loop only to repeat the routine or a portion of it.

3) Use *IF . . . THEN . . . ELSE* to minimize jumping forward. Many times all the code for the choices can be contained after *THEN* and *ELSE* on one line so that the procedure can continue on the next line. Some BASIC's don't have *ELSE.* Apple doesn't, and Apple owners pay extra for the lack. To illustrate, which is clearer to you?

```
10 IF X=0 THEN PRINT “FALSE”:X=1 ELSE PRINT
   “TRUE”
20 END
```

or

```
10 IF X=0 THEN 30
20 PRINT“TRUE”: X=1: GOTO40
30 PRINT“FALSE”
40 END
```

4) Put all subroutines in one of two places. Frequently called subroutines which include those that affect program speed should be at the front of the program. I reserve Lines 5 to 99 for these. These should not be more than three or four lines. Line number spacing of two is good.

Putting these here serves two functions. First the computer finds them quickly when speed counts. You also save bytes since the number in the *GOSUB* is only one or two bytes long. Infrequently called routines, particularly program initialization code should be at the end of the program. Each time a subroutine is called or the computer is sent to a specific line, it starts at the beginning of the program and searches until it finds that line. The fewer lines it passes to find the needed line the faster the search will be.

It follows that speed is compromised if the computer is continually searching over code it has used and will not use again. Clarity comes from having only two places to look for subroutines. The one exception that I make is to place a major subroutine at the end of the module that calls it when only that module uses it.

> "Owning a complex machine like a computer is both an exciting and a frustrating experience. Even the simplest program that works gives the new owner a feeling of power and accomplishment."

5) The same reasoning used above also applies to the ordering of main program modules provided they are called separately. Those used most frequently are put in front of the occasionally used ones. In a file program, the input module is used far more than the save to tape module and should come to the front. Modules that are used in order should be placed in order in the program.

6) Menus should be placed where they are used in the program. A menu's text provides valuable information on the branching of the program that follows. If menu choices are numbered from one up in sequence, the *ON* I *GOTO* XXX,YYY,ZZZ or *ON* I *GOSUB* XXX,YYY,ZZZ commands can be used. It is easy to read a listing, see which number corresponds to the code block you want and then drop down to the *ON* I statement and count across to find the target line number.

Memory conservation sometimes forces use of strings defined elsewhere in the program in menu text. When this is done the advantage of reading the menu code to know what options are there and where to go for their code is lost.

Programming is a series of compromises. It is up to you to know what your options are and to make sure that your choices are educated ones and not guesses or blind repetition of past practices.

Though I have discussed program structuring for purposes of easy trouble shooting and modification, the structure proposed had program speed firmly in mind as well. Memory use was another consideration. Clarity, memory and speed are like three corners of a triangle. You cannot be at all three points at once. You can make choices that shorten the sides of the triangle and get close to where you want to be. It takes careful thought and planning at the start so you don't end up redoing too much.

Don't be upset when you don't get what you want the first or second time. Remember all good commercial programs have version numbers and Version 1.0 is the first one offered *for sale, not* the first one of the *development* process.

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CAPTAIN EIGHTY

The Magic Software Machine

By Captain Eighty
(a.k.a. Bob Liddil)

In the wintertime, I like to sleep late. Max knows this and usually doesn't bother me. Max, for those of you who don't know, is a sentient computer program and the only one who knows how to use all the prototype gadgets that Professor Megabyte left in the attic lab of the house I live in. He left behind Max and a gadget called a DDS (short for Dimensional Download System), which can download a human into the world of computer software. Personally, I wish Max *didn't* know how to operate that thing.

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It is disconcerting to go to sleep in a nice, warm waterbed in winter-bound New Hampshire and wake up the next day in the Old Programs' home guestroom in Programworld. I recognized the room because I've been here before.

Programworld is a dimensional subdivision where individual units of software are born, grow strong, grow old and retire. Old programs never die. They take their software social security and go to live in bulletin boards as downloads or they retire to the Old Programs' home.

I dressed in the tuxedo provided in my wardrobe. I learned long ago the futility of resisting my environment when downloaded. I had just put on my top hat and adjusted my tie when my escorts, two programs in training, arrived to take me to see the head honcho.

My host turned out to be none other than Grandfather Adventure, the original collossal cave adventure, written lo these many years ago on the mainframes, and elected to be governor of Programworld two years previously. It seemed, they told me, that I'd been invited to a wedding.

The bride was an unknown but brilliant arcade-style game. The groom was the very successful and popular Adventure game. It was like a scene from a bad movie with the friends and relatives of the bride, all popular or retired arcade games, sitting on one side of the room while friends and relatives of the groom, all traditional Adventure games, sat on the other. Each group glared at the other; there was much anger and hostility between them.

I saw many programs I knew as I made my way down the center aisle to take my place next to Grandfather Adventure and Pong, senior arcade game in the community. These two old duffers seemed to be taking the event well, although no one else appeared too happy at all.

The ceremony progressed speedily until they got to the

---

*(Bob Liddil, **Captain Eighty**, is a well-known writer on Color Computer topics who has numerous columns and several books to his credit.)*

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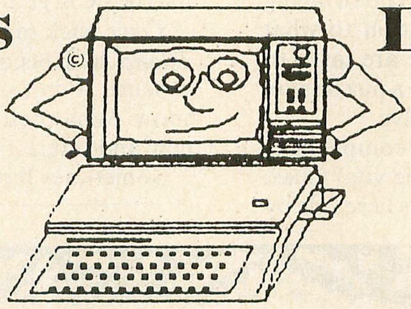

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part where the groom was instructed to "kiss the bride." At that point, things got weird. He took her into his arms and kissed her, whereupon they were both engulfed in a brilliant blue glow. The light grew brighter and the two programs within grew blurred and indistinct until I could not tell one from the other. When the light cleared and faded, there was only one program to be seen.

"It is with great pleasure," said Grandfather Adventure, addressing the group, "I present to you, the best of our two families, molded together into a single superprogram."

He paused dramatically, then gestured toward the new program still bathed in fading light.

"I give you the new *Calixto Island!*" He finished. The applause was thunderous. Programs began spilling out of their seats and into the aisles slapping each other on the backs and congratulating each other.

The party that followed was a real blowout.

Calixto Island (Illustrated) is indeed the wedding of two exciting and often clashing genres of commercial software. It combines the brainfare and verbal skills required of the Adventure player with the brilliant, often animation-quality graphics techniques found in the best arcade games.

The beginning of the game finds us in a three-room scenario with an attic, a cellar and a living room depicted in complex high resolution compu-photographs. The swinging pendulum of the living room clock adds motion to what already is a stunningly detailed screen. There are tasks to perform, clues to decipher and the beginning of a puzzle sure to take anywhere from weeks to months to solve.

Overall, I viewed many more locations and complexities than I can outline without giving away plot or vital clues. Rest assured that enough pure Adventure exists here side by side with brilliant graphic enhancement to convert even an ardent text-adventure fan like myself. I like this one a lot.

Mark Data Products has always been a source of excellent computer software products. *Calixto Island* was a hit in its original form. Now, in its pictorial edition, this excellent Adventure joins the disk-based illustrated compunovels which have already made a market splash and cover a unique segment of consumer computerists by being tape-based, wholly contained in memory.

Retailers will appreciate the no-nonsense packaging offered here. It is a colorful blister pak, easy to store and display. The consumer, always well-treated by Mark Data, will appreciate the attention to detail, lavishly and lovingly supplied by both the story programmers and the illustrators.

If this is an example of Mark Data products and their commercial philosophy, then strike up the band! They're giving more value than cash received.

I slipped away from the party after about an hour and went to the conference room where I knew I would be most likely to be able to contact Max. I'd already given my best wishes to the new Adventure and thanks to my hosts. Now it was time to go.

Sure enough, Max had been standing by waiting for me. The upload was painless and without incident. Hmmm, maybe he is getting the hang of this DDS stuff.

Once back in the lab, I found a pleasant surprise. *Calixto Island* had been loaded into the Color Computer in my absence. I can see out the window that it is beginning to snow. What better way to spend the day than playing this new and interesting game.

Sometimes having Max around is not so bad.

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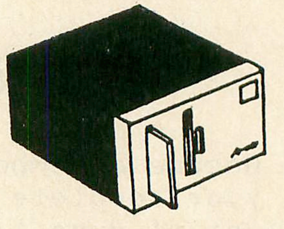

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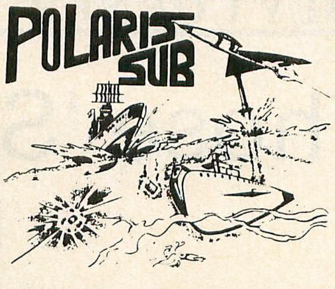

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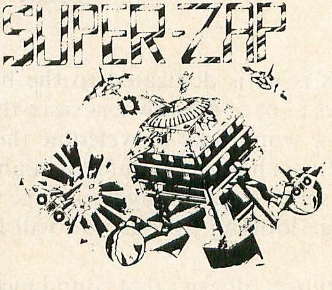

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Those 'Strange-Looking' Listings

By D.S. Lewandowski
Rainbow Contributing Editor

This month's issue is dedicated to the beginner. I'm sure we have a lot of new owners since the visit of the Red Elf. We would like to welcome them to fellow ownership of the finest home computer available. Since the main topic of this series is Assembly Language we will try to explain the strange looking listings you will find in magazines.

As for you *old timers* (doesn't that sound nice!), I have to explain a little problem I have been trying to rectify. The final part of *Text* was indeed complete, however the files were destroyed. I had to wait for *the Rainbow* to come out to just catch up to the point where you are. Since you never write a program the same way twice I have been trying to finish it again since. As soon as I do, it shall be here, thanks for your patience.

First off we should start by telling you that assembly language and machine language are different. Assembly language involves the use of an Editor/Assembler. The Editor is the means of entering text, similar to a word processor. The text is used by the Assembler to form a machine language program. The text used by an Assembler is called *source code*. The program formed by the Assembler is called either a *machine language program*, or *binary code*.

You will hear some people say that they wrote a program in machine language, which could be true, however most of the time they wrote the program in assembly language. Now to confuse matters evem more, most Editor/Assemblers have a *monitor* (which is nothing like a TV). A monitor is a machine language program provided to allow the user to *debug*, or at least look at, the machine language program once it is assembled.

To write in assembly language you will need an Editor/Assembler package. The two I prefer, and can recommend are: *EDTASM+* by Microsoft, sold by Radio Shack; and *SDS80C*, or *MACRO 80C* (Disk version) sold by Micro Works. Both packages are well written, fairly easy to use, and almost totally debugged. Probably 99 percent of the time when you see a listing in source code it will have been written by one of these packages. There are a couple of minor differences between them, and both have one major drawback, which we shall attempt to rectify here.

The drawback is that both packages "assume" that you know how to operate them. The instruction manuals for both fall into the classification of "fair" reference material.

There is a book available through Radio Shack called *Color Computer Assembly Language Programming* by W. Barden, Jr. It is very good, however it was written about two years ago, and certain examples won't work with the newer machines. (See, you were doing it right!) Don't blame Radio Shack, or the author, it was just a problem with publishers, and other technical things that go into getting a book on the shelves. I still strongly recommend it.

Okay, enough background, let's get into how do I use this $50 up package? I'll assume your a complete novice. So insert your ROM pack, or load the program from disk. By the way *never, never,* insert a ROM pack with your computer powered up. It will "kill" your computer, it says so in your owner's manual, and with every ROM pack you purchase. Okay, once the program is executed (which means running—you don't have to take the computer to the wall each time and offer a blindfold), you find yourself in the *command mode,* this means the program is waiting for a command from you. Since we just started there is no text in the computer, so we enter the command "I" for insert text. The *EDTASM+* will give you a line number, *SDS80C* will not, but will print LINE INSERT across the top of the screen. Easy young Jedi, let's explain that there are four columns availble to you at this point. Pressing the right arrow will move you into the second column. Each time you enter the insert mode, or press enter you will be in the first column.

Each column has its own special function. The first column is for *labels.* These labels are used similar to line numbers in a BASIC program, don't confuse the line numbers in *EDTASM+* with BASIC line numbers. These numbers are just for editing. The second column is for the *instruction.* The instruction, or action of the line, is also called the mnemonic, op-code, and operation code. No matter, they all refer to the same column. The third column is used for data, it can be a number, a register, a string of text, or blank, this depends on what is in the instruction column. The fourth column is used for comments, this column's use is optional. You would use comments to remind yourself, or tell another reading your code, what the line is doing. Again you press the right arrow key to get to the next column in each line. Once you have finished entering the text you complete the line by pressing [ENTER]. This automatically puts you into the next line of text, similar to automatic line numbering. To exit the insert mode you have to press [BREAK,] which will bring you back to command mode.

(Dennis Lewandowski, one of the early authors active with the Color Computer, specializes in machine language programming. He and his wife, Rose, founded DSL Computer Products.)

Okay, let's write a program, assemble it, and execute it. In this program you will see three instruction which are to aid you, they are [T], [E], [B]. [T] means tab, or press the right arrow key. [E] means press the [ENTER] key. [B] means press the [BREAK] key. *Do not* type in these instructions, which are indicated in brackets, as you type in the following:

```
[T]             ORG [T]       $E00 [E]
START [T]       BSR [T]       CLS0 [E]
JOYSTK [T]      JSR [T]       $A00A [E]
[T]             LDA [T]       $15A [E]
[T]             STA [T]       RLVAL [E]
[T]             LDA [T]       $15B [E]
[T]             STA [T]       UDVAL [E]
[T]             LDA [T]       $FF00 [E]
[T]             CMPA [T]      #$7E [E]
[T]             BEQ [T]       CLS0 [E]
[T]             LDA [T]       UDVAL [E]
[T]             ASRA [E]
[T]             ASRA [E]
[T]             LDB [T]       #$20 [E]
[T]             MUL [E]
[T]             ADDD [T]      #$400 [E]
[T]             TFR [T]       D,X [E]
[T]             LDB [T]       RLVAL [E]
[T]             ASRA [E]
[T]             ABX [E]
[T]             LDA [T]       #$FF [E]
[T]             CMPX [T]      #$5FF [E]
[T]             BGT [T]       FIXX [E]
STORE [T]       STA [T]       ,X [E]
[T]             BRA [T]       JOYSTK [E]
CLS0 [T]        LDX [T]       #$400 [E]
[T]             LDA [T]       #$80 [E]
LOOP [T]        STA [T]       ,X+ [E]
[T]             CMPX [T]      #$600 [E]
[T]             BNE [T]       LOOP [E]
[T]             BRA [T]       JOYSTK [E]
FIXX [T]        LDX [T]       #$5FF [E]
[T]             BRA [T]       STORE [E]
RLVAL [T]       FCB [T]       0 [E]
UDVAL [T]       FCB [T]       0 [E]
[T]             END [T]       START [E]
[B]
```

If you typed in the above correctly, you are ready to Assemble the program. But, before we assemble it, let's save it on tape. If you have a disk system, read the instructions which came with your Editor/Assembler to save your file except for *MACRO-80C*. To save the text, or source code, enter the command W JOYTEST (E) for *EDTASM+*. Press [W] then enter "JOYTEST" for *SDS80C*. To Assemble, you have to know how to get the assembler to operate. For *EDTASM+* enter the following commands, A/WE/IM [E]. For *SDS80C* press the [@] amphere key, then press "M" [E]. For *MACRO-80C* press the [BREAK] key, it will ask if your done, answer "Y" for yes. Then save the text to Disk. The Assembler is a different program, so you have to *RUN* "ASSEM."

Whichever of the three ways you do it you have assembled the text into a machine language progam. The program exists in two places, first in text in your Editor, second in

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memory as a binary set of instructions. Hopefully you also have the text in a third place: tape or disk. If you got an error while assembler was working, it is a typing error. There is no possible way an assembler can check for programming errors, it will allow you to write anything as long as you follow its syntax.

Okay, let's assume everything has gone fine. To execute the program do the following for your package. *EDTASM+* type Z [E] then GSTART [E]. For *SDS80C* you will be in *ABUG,* just type G [E]. For the disk jockeys you have to *LOADM* "JOYTEST" then *EXEC* [E]. The program is simple enough just move the left joystick around, and the screen traces it in orange. Pressing the fire button clears the screen to black. The program is a loop, so you must press the reset button, on the back of your computer to exit.

Finally, to make a machine language program, so you don't need to have the ROM pack in while running this program, follow these steps. *EDTASM+* — type A JOYTEST [E]. *SDS80C* press [@] then type T JOYTEST [E]. MACRO 80C creates the machine language file from the text file during assembly. Well that's all for this month, hope you enjoyed your little trip into assembly language. If you would like some more info, check *Rainbow* Technical Editor Dan Downard's article in this issue and/or send either a 37¢ stamp, or two 20¢ stamps to DSL Computer Products, P.O. Box 1113, Dearborn, Mich., 48121, for a booklet called *Using An Editor/Assembler.*

The Listing:

```
0E00                00100           ORG     $E00    WHERE PROGRAM GOES IN MEMORY
                    00110 *JOYSTICK TESTING PROGRAM
0E00 BD   34        00120 START  BSR    CLS0    TURN SCREEN BLACK
0E02 AD   9F A00A   00130 JOYSTK JSR    [$A00A] SAMPLE JOYSTICK
                    00140 *USE SHIFT DOWN ARROW & SHIFT RIGHT ARROW FOR BRACKETS
0E06 B6   015A      00150        LDA    $15A    RIGHT/LEFT VALUE
0E09 B7   0E49      00160        STA    RLVAL   SAVE VALUE
0E0C B6   015B      00170        LDA    $15B    UP/DOWN VALUE
0E0F B7   0E4A      00180        STA    UDVAL   SAVE VALUE
0E12 B6   FF00      00190        LDA    $FF00   CHECK FOR FIRE BUTTON
0E15 81   7E        00200        CMPA   #$7E    PRESSED?
0E17 27   1D        00210        BEQ    CLS0    IF SO CLEAR SCREEN
                    00220 *THIS GETS SCREEN LINE 1 THRU 16
0E19 B6   0E4A      00230        LDA    UDVAL   GET VALUE
0E1C 47             00240        ASRA           DIVIDE BY 2
0E1D 47             00250        ASRA           DIVIDE BY 2 AGAIN
0E1E C6   20        00260        LDB    #$20    PUT HEX 20 IN B
0E20 3D             00270        MUL            MULTIPLY A*B
0E21 C3   0400      00280        ADDD   #$400   ADD SCREEN OFFSET
                    00290 *BY THE WAY A+B=D. A = THE FIRST HALF, B = SECOND HALF
0E24 1F   01        00300        TFR    D,X     SAVE THE RESULT IN X
0E26 F6   0E49      00310        LDB    RLVAL   GET VALUE
0E29 57             00320        ASRB           DIVIDE BY 2
0E2A 3A             00330        ABX            ADD B TO VALUE IN X
0E2B 86   FF        00340 STORE  LDA    #$FF    ORANGE GRAPHIC
0E2D 8C   05FF      00350        CMPX   #$5FF   SEE IF OFF SCREEN
0E30 2E   12        00360        BGT    FIXX    IF SO FIX X
0E32 A7   84        00370        STA    ,X      PUT ON SCREEN
0E34 20   CC        00380        BRA    JOYSTK  DO IT AGAIN
0E36 8E   0400      00390 CLS0   LDX    #$400   START OF SCREEN
0E39 86   80        00400        LDA    #$80    BLACK GRAPHIC
0E3B A7   80        00410 LOOP   STA    ,X+     STORE CONTENTS OF A
0E3D 8C   0600      00420        CMPX   #$600   END OF SCREEN +1
0E40 26   F9        00430        BNE    LOOP    KEEP GOING TILL DONE
0E42 20   BE        00440        BRA    JOYSTK  BACK TO TEST
0E44 8E   05FF      00450 FIXX   LDX    #$5FF   BOTTOM OF SCREEN
0E47 20   E2        00460        BRA    STORE   BACK TO PROGRAM
0E49      00        00470 RLVAL  FCB    0
0E4A      00        00480 UDVAL  FCB    0
          0000      00490        END
```

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Due to heavy demand, we suggest you order back issues you want now while supplies last.

In addition, copies of the cover *only* of the July, 1982, Anniversary Issue are available separately for $1 each, plus 50 cents shipping and handling. These are suitable for framing.

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REVIEWS

VOICE-PAK

Editor:

The November issue of *the Rainbow* contained one review and one article on the speech products from Spectrum Projects. Both were very favorable but both conveyed a rather large misconception to your readership.

I am Frank Delargy, president of DEL Software and author of the speech programs that are sold with the Spectrum Voice-Pak and other speech synthesizers, including those from Speech Systems and Kelty Engineering.

In his very favorable and much appreciated review of the Voice-Pak, Bruce Rothermel made a few statements that really should be explained more clearly. When Bruce wrote, "What makes the speech so understandable is a phonem dictionary . . . if a word is not in the dictionary, it reverts to the phonetic rules stored in the chip," a major error (from my point of view) was made. First, the Votrax chip has no rules whatsoever, stored in it. The sole function performed by the chip is to make a short noise when one of 64 codes is transmitted to it. It does not know how to pronounce anything. What really makes the computer pronounce words is about 5,000 bytes of 6809 code contained in the program *TRNSLATE* or TRNSLT16. There are over 500 separate rules and decisions that the program makes in order to translate English text into Votrax codes. These rules will accurately pronounce practically any word in the English language. When a word does not follow the rules it can be placed in the dictionary along with the proper pronunciation (in Votrax phonemes). The dictionary is, in essence, an exception table needed only for a very small percentage of the words you might wish to speak out. The word "one" is in the dictionary because it does not conform to the normal rules of English language pronunciation.

Frank Delargy
DEL Software

FUNDFILE

Editor:

After reading the review of *Fundfile* in the November issue of *Rainbow* magazine, I felt compelled to comment on it. *Fundfile* is a computer program for use by investors for managing their stock and fund investments. The review of *Fundfile* by Ed Lowe appears to be a mismatch of reviewer and program. Mr. Lowe states in the review that he doesn't "happen" to have a portfolio of stocks and/or funds lying around" and he "thinks that money is safest under the mattress." He obviously doesn't need *Fundfile* to keep track of his investments.

We feel Mr. Lowe's comments on "the difficult to follow documentation" may be partly due to his unfamiliarity with the investment field, but we also recognize that porgram documentation is important and can generally be improved. We are rewriting the documentation so that novice investors will find it easier to follow and easier to use *Fundfile* (and its companion program, *Fundgraf*, which was reviewed favorably in January '83 *Rainbow*). We expect to complete the rewriting by December.

R. E. Parsons, President
Parsons Software

MOTORBIKE CHALLENGE

Editor:

After reading the software review of *Motorbike Challenge* by Pat Downard in the October issue of *the Rainbow*, I bought this game from Microcom Software. I fully agree with the review that it is a thrilling game for motorbike adventure lovers. My younger brother and I play and enjoy it a lot! We know that we can count on your judgment and review. Thank you for recommending this game for CoCo users. Keep up the good work!

Gary T. Jes
Cincinnati, OH

THAT'S INTEREST-ING

Editor:

Mr. Parks' review of our interest programs (November '83) described a minor bug in the program. Although his description of the mechanism was quite inaccurate, we did find a problem which was triggered by an unexpected and unusual set of input parameters and did result in the indicated effect. Obviously, it has now been corrected.

Melvin Hefter
Custom Software Engineering, Inc.

STATEMENT WRITER

Editor:

In Mr. Hogan's review of our *Statement Writer* program (December '83), he states, "The real power of both *DDE*[*Double Disk Entry*] and *SW* is the ability that has been designed into both programs for user modification." *Statement Writer* has been designed and documented to allow for easy user modification. We came up with a reasonable statement format for general use on plain paper, but we also knew that many users would want to put in changes to accomodate preprinted forms or other special requirements. This was the reason for the "designed to change" concept.

But *DDE* is different. It does have its high level code in BASIC and a user proficient in BASIC could change this code if he desired, but *DDE* was *not* designed or documented with user change in mind. The user does set up the account structure (without any change to the program code) and this does drive the format and content of the standard accounting reports *DDE* generates. The user does customize the total system for his needs, but this is usually done without any changes to the *DDE* program itself.

Melvin Hefter
Custom Software Engineering, Inc.

MATH FACT

Editor:

I'm a third-grade teacher and have used B-5's *Mathfact* program (September 1983, Page 202) I felt Rick Cobello overlooked some of the strengths of the program in his recent review.

First, the program contains a choice of addition, subtraction, multiplication and division facts, or a mixed presentation all in one program. This is a good value. This also allows the teacher/parent a choice of how to present the material.

Second, all the problems within the set are presented ensuring the student will receive practice on any problem with which he/she may need additional help. I have used programs where the facts appeared randomly and the student has never encountered the particular fact he needed to work on.

Third, the answer is not given if a fact is missed because the program branches back to the pictures of blocks. The students may count the blocks to determine the answer. Hopefully, this will help the student remember the answer longer and reinforce the mathematical concepts behind each operation. The next best thing to counting real blocks is counting a picture of blocks. Helping the child to discover the answer for himself is more educationally sound than merely giving the answer.

I also feel Mr. Cobello missed the point of the "Guess the Number" game at the end of the drill. The chance to play the game is the reward, not the winning of the game. Side-learning is an additional benefit from the game when the child uses ideas of greater than, less than, and when the child approximates with reasoning to guess the number.

I take exception to Mr. Cobell's comment that drill and practice programs should be left to paper and pencil unless the presentation is unique. I know of no paper and pencil program which branches back to symbolic pictures as soon as a student gives an incorrect response. Elementary students spend much of their time drilling and practicing. Why shouldn't they have the opportunity to enjoy practicing on a computer as well as paper and pencil?

In conclusion I have found *Mathfact* to be a worthwhile program. I'm glad I've had the opportunity to use it.

Mrs. M. J. Burger
Vermilion, OH

LOWRCASE

Editor:

By now you're probably aware of the great disservice done to your readers by Mr. Ed Lowe's review of our *LOWRCASE* program in the December issue of *Rainbow*. It would have been nice if he reviewed our program, but instead he reviewed the LPVII/DMP100 printers.

The reviewer first gave his opinion of the printer when he said he invested in a LPVII to have "some means of listing programs . . ." His opinion when he needed better quality characters was: "I simply saved my pennies" and bought a better printer. So why bother with the LPVII/DMP100; it's "not worth the effort" — I can't believe he means this. There are many LPVII owners that cannot afford to upgrade and would rather spend the $15.95 for our program. The reviewer calls our program "too expensive," yet the price of our program is much less than another $400 or so for a printer upgrade. So, instead of a quality review with constructive criticism (there was none), the reviewer proceeds to give the mistaken impression to the readers that our program is no good. If this is the type of review that you approve of then we will not submit future programs for review, but will let them sell on their own merits.

I hope that interested readers will contact us directly for the correct information about the *LOWRCASE* program; we would hate to see them do without true descenders because of this review. It is too late to fix the damage done by this review; but I will again ask for a review of our program, and not the LPVII/DMP100 printers. Thank you.

Ken Elder
KRT Software

VOCABULARY BUILDER

Editor:

I would like to commend Steve Blyn from Computer Island on the articles he has submitted and the expressed care he has shown in preparing educational programs. I spent some time in preparing the review of the *Vocabulary Builder* program (September 1983) and agonized greatly over the somewhat negative tone which I was sure the review would carry. However, in my opinion, the criticisms were appropriate. Although not stated in the review, I did indeed try the program with children. The opinions were, at best, mixed. In all fairness, the sample of children was very small and hardly constituted a fair test of opinions that might be expected and certainly did not constitute an adequate test of the program's effectiveness. I, therefore, chose not to include those opinions.

The main strength of the program would be the inclusion of a large amount of questions, provided there was a probability that content of the program was fully covered. I am in favor of using "random order of presentation" of questions (which was used by this program) and go one step further by stating that the order in which answers are presented should be random. Although the order of answer presentation may have been initially randomized, each time the same question appeared the same order of answers appears with this program. However, I do not feel that once a good representation of content is chosen, that the selection of which content is presented should be a random process. Such a method (as was used in this program) has the following effect.

1) There is a good probability that most, if not all, students will not receive full coverage of the intended content.

2) There is an even better probability that the coverage of content across individuals will be uneven. Some individuals will receive greater exposure to a smaller number of items. Other individuals will receive a lesser exposure to a greater number of items. There is no "guarantee" that a specified number of questions will be repeated an some questions will be new. In fact, it is possible (assuming an adequate randomizing model is used) that some individuals could see only 50 items while others could see all 200 items.

I used a statistical model and computer generation to determine the number of words that would be unused for any specified number of trials and the *Vocabulary Builder* program. The computer generation procedure duplicates the number of words that would be exposed to 100 individuals who were given 10 trials with the program. The results of both methods were nearly identical. It would be expected that less than 75 percent of the total available words would be used after four trials with *Vocabulary Builder*. However, had the program been segmented into four equal parts of 50 words each, the entire content could be covered without a single repetition.

If repetition is desirable, then the segmented method could be repeated again. After eight trials, each individual could be exposed twice to all of the content. However, the method used by *Vocabulary Builder* does *not* guarantee this type of exposure. In eight trials (using the method employed in *Vocabulary Builder*), it is expected that less than 90 percent of the content would be covered for most individuals and certain individuals could be exposed to as little as 25 percent of the total content.

If I had considered this matter simply trivial, I would not have commented further on this review. I believe that several methods that would employ full coverage of the content would offer a more efficient learning experience. Mr. Blyn has replied that memorizing of the position of an answer was a problem in field tests and, therefore, the method used was appropriate. However, the program does *not* randomize answer position across repetitions. Further, randomizing the order of question presentation (as well as answer position) is possible without sacrificing full coverage of content.

Mr. Blyn takes issue with a suggestion that the possible reduction of the amount of memory is an appropriate criticism. If a similar program proves to be more effective or even only equally effective, then the less memory required the better. Schools or parents with limited budgets could utilize the program on less expensive equipment. Perhaps the reduction from 32K to 4K would sacrifice more advantages than would be gained. However, by breaking the program into four programs consisting of 50 items each is viable for a 16K machine and in my view advisable.

I am not suggesting the inclusion of less vocabulary words in the total package, but rather that you consider alternative (perhaps less memory dependent) methods for presenting those words. Including four sets of 50 words (four separate programs on one tape) is one of many methods that could be used.

In relation to using an *INPUT* vs. an *INKEY* routine, Mr. Blyn offers some very valid arguments. I would still prefer the quicker pace that using a single key stroke would allow. Research appears to support quicker paced material over slower paced presentation. However, I could not state for certain that his would lead to more effective learning for this particular program. On the other hand, an *INKEY* routine does not negate the use of error correction. Consider the following routine:

```
10 X$=INKEY$: IF X$=CHR$(8) THEN
A$="":?@160," ":GOTO 10 ELSE IF A$=
CHR$(13) THEN GOTO 20 ELSE IF X$=
>"A" AND A$<"D" THEN A$=X$:?@160,
A$:GOTO 10 ELSE GOTO 10
20 REM THE ROUTINE TO CHECK
FOR CORRECT ANSWERS GOES HERE
```

This routine allows for changing to another answer or erasing an answer. The *INPUT* routine used in the *Vocabulary Builder* program allowed the input of information beyond the space provided for that answer, thus a student could erase part of the existing screen before pressing [ENTER].

The Rainbow sends a set of instructions to its reviewers. Reviewers are told to offer suggestions about how a program can be improved. I feel that suggestions for improvement for the *Vocabulary Builder* program are especially appropriate since the documentation invites the user to alter the program for their own uses. I think that, upon reflection, Mr. Blyn would agree that a discussion of programming techniques is appropriate for a review where such suggestions are aimed at improving the quality and usefulness of the product.

Dr. Charles H. Santee
Darien, IL

Programmer's Toolkit
A Useful Assemblage

I recently received a tape of programs collectively called *The Programmer's Toolkit.* The toolkit consists of a series of six machine language programs, each designed to aid in the programmer's work. Of the six, I quickly settled on two programs which I found to be most useful.

The first is called CROSSREF. It is a cross-reference program which will go through a BASIC program and generate two cross-reference listings. The first contains all the numeric variables followed by all the string variables in alphabetical order. The number of every line in which each variable is used is printed next to the variable.

The second list contains all line numbers referenced by *GOTO* or *GOSUB* along with the number of each line containing the *GOTO* or *GOSUB.*

A nice feature of this program is that it tests for a printer being connected and ready. If one is, the lists are printed; otherwise they are displayed on the screen.

The first time I used this program, I thought something was wrong. When it began to *EXECute,* a sign-on message appeared and then the computer just sat there. As it turned out, the program was generating the list and sorting it into sequence. Once that task was completed, the list printed at full printer speed. Actually, this program runs considerably faster than a similar program I saw on an IBM-PC!

The next program that I find myself using heavily is the one called EDIT. It is an editor for BASIC lines that is considerably easier to use than CoCo's own editor. Although it is called a "full screen" editor, it works on only one line at a time. Its features include full cursor control using the arrow keys, a very nice insert function, character delete and non-destructive backspace. A feature I like is the ability to copy a line somewhere else in the program by changing the line number. There is also auto-repeat on all keys.

EDIT also has a list feature that lists from some starting line number and fills one screen. To continue the listing simply hit [ENTER].

There are two weaknesses in EDIT. First, there is no enter mode as such. It can be used to enter a program but it was obviously not designed for it. The second weakness I consider to be a major deficiency—it will not add a line with a line number lower than the highest line number in the program. If you are editing a program and have to add an overlooked line of code you must exit EDIT, add the line through standard BASIC, and then return to EDIT.

The other four programs in the toolkit are nice to have but used less frequently than CROSSREF and EDIT.

The program called CMERGE merges two or more BASIC programs. The procedure uses a series of *PEEKs* and *POKEs* has been documented in these pages several times. In the toolkit we have a program to do all the work for us.

CHAINRUN is a mixed BASIC and machine language program that provides the capability of chaining from one program to the next—a feature of many disk systems but not previously available for CoCo cassette programs.

HEXEDIT allows the user to view and modify any memory location. A nice feature of HEXEDIT as compared to some other monitors I have seen is that it displays a block of locations in hex on the upper area of the display and the ASCII contents of those same locations in the lower half. This makes it particularly easy to pick out text-type data.

Finally, DUMP is a subset of HEXEDIT that only displays memory locations without any ability to change them.

The Programmer's Toolkit requires at least 16K but Extended BASIC is not required.

(Moreton Bay Software, 316 Castillo Street, Santa Barbara, CA 93101, $28.95)

—James G. Kriz

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The *VIP:* Still A Super "Color" Terminal

By Jim Reed

When Tom Nelson asked me a few weeks ago why *the Rainbow* had never reviewed *VIP Terminal* (formerly known as *Super "Color" Terminal*), I told him I was quite sure we had; he just must have missed it. After all, it is one of *the Rainbow*'s work tools. We use it every day.

On hanging up the phone I grabbed an index and searched; I couldn't find a review. Well, any of us here at *the Rainbow* could review this old friend. I suppose that omission of a review on this first-rate piece of software is sort of like not seeing your glasses because you have them on. Anyway, this excellent utility deserves its due, so let's remedy that, pronto.

The *VIP Terminal.* I've gone through a lot of changes with this benchmark of terminal programs: introduced to it as a tape program, learned to trust it as a ROM pack, and grown to rely on it as my single, most often used disk utility.

The *VIP Terminal* is one of several "intelligent" terminal programs on the market. Intelligent terminal programs are those that have such features as uploading and downloading, printing out the buffer, saving the buffer—that do what the "dumb" terminal you bought *you know where* won't do. If you have a modem and intend to communicate with other computers, you need an intelligent terminal program like *VIP Terminal.*

VIP Terminal has all the features needed to engage in data communication. Yes, some other programs now on the market may have a bell or whistle that this veteran doesn't, but the *VIP Terminal* is loaded with features and has everything you need to communicate with most any computer or microcomputer with RS-232 capabilities. It can handle any type of text in any system.

When you load in *VIP Terminal* from disk, it automatically checks to see how much memory your computer has and will allocate buffer space accordingly—up to 51K (if you have 64K and don't use the Hi-Res format which requires 7K itself). Among its features, the *VIP Terminal* has:

—Selectable screen formats, 32 by 16, and 51, 64 or 85 columns by either 21 or 24 lines (for a total of nine display sizes). While several of my friends and associates prefer the 51 by 24 display, I like the more familiar 32 by 16 because it scrolls more quickly (the extra processing time for the Hi-Res software routines makes them slower than the standard 32 by 16 display that is built right into the CoCo's hardware) and the print is much larger. An added feature of any of the Hi-Res modes, though, is true lowercase instead of inverse video. Additionally, the 64-column mode offers a choice of wide or narrow character sets. One note: the 85-column mode is very hard to read and should be considered only a formatting screen.

—Four display color choices (except in 16K). In the 32 by 16 mode, you can have either a green or an orange background. In the Hi-Res modes, your color options are black characters on either a green or a white background, or green or white characters on a dark background (inverse video).

—Word wrap-around. If an entire word won't fit at the end of a given line, it is automatically moved down to the next line. Most of us take this feature for granted, but how primative it would feel now not to have it.

—Graphics support. Yes, you can receive, and send, pictures as well as text.

—Modified parameters. While, for many uses, you may not need to change the RS-232 protocol, there are many times you may require non-standard parameters—for instance, when I need to send something directly from the CoCo to *the Rainbow*'s typesetting computer. On loading *VIP Terminal*, the parameters are initialized for the most common protocol and if you are in doubt when changing parameters, hitting [ENTER] usually will cause the program to default to the most often used value for that given parameter.

—Buffer display and/or printout. It's nice to be able to page through the buffer's contents, first to satisfy yourself that you have what you're after by actually seeing the contents on the display screen, and also to pass by any large blocks you don't want to print out. Since I frequently load substantial material into the buffer and usually only want to print out a small portion, this is useful. It would be even handier, though, if I could write to and edit the buffer without having to transfer the contents to a word-processing program. Maybe a primitive editor could be added.

—Keystroke multipliers (KSMs). Keystroke multipliers—or should we call them keystroke reducers—allow you to create and edit up to 10 short messages which can then be sent with just two keystrokes. The messages can be as long as 255 characters. Not only are these useful for repetitive phrases, but you feel more like you've harnessed a bit of computer power when you press, say, [CLEAR] [2] and your BBS I.D. number slides onto the screen in answer to a host computer inquiry. Then [CLEAR] [3], and your password is sent, too.

—Disk commands. *VIP Terminal* allows you to load, save, rename, change default name, kill a file, and display disk directory. All of these commands are similar to those in the Radio Shack DOS, but *VIP's* directory command also shows the number of free granules available and an asterisk will denote any faulty disk that should not be written to. *VIP Terminal*'s mini disk operating system is also used in other VIP Library programs.

There are several other features, such as Xon/Xoff, lowercase masking and selectable trapping that make the *VIP Terminal* highly versatile, whether you are receiving information or transferring it to another computer, downloading or uploading BASIC programs, transmitting or receiving binary files, using intelligent modems, communicating between two Color Computers, or even communicating with a dumb terminal. In my opinion, the 33-pages of instructions in the handsome binder is one of the best examples of good documentation you're likely to come across.

The *VIP Terminal.* I recommend it without reservation as a quality product. In the times I've used it, I've had only one problem: I did encounter some trouble handling ASCII files when using an earlier version, but that problem has been solved with the latest version.

VIP Terminal is both user-friendly and thoroughly professional. Dan Nelson is clearly a top-rate programmer and Tom Nelson's expertise also shines through the well-written operator's manual. The *VIP Terminal* is still a super color terminal.

(Softlaw Corp., 9072 Lyndale Avenue South, Minneapolis, MN 55420, Disk or ROM pack, $49.95)

Panic Button—
Ah, What Sweet Revenge

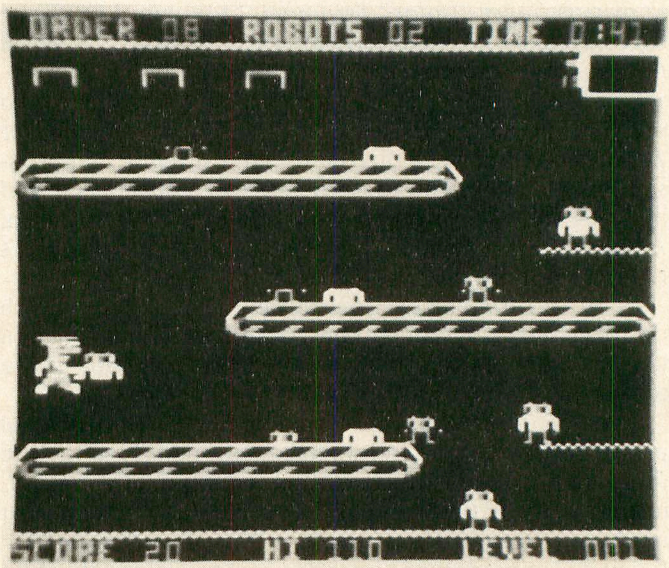
It was finally my chance to do something I've always wanted to do to just about every boss I've ever had—throw a cake in his face. All that pent up aggression raced through my fingertips as I slung that messy cake . . . and he didn't even duck! He asked for it though, screaming at me to move quickly as I assembled robots, cakes, houses, televisions, lamps and telephones on his speedy conveyor belt.

If you like a Hi-Res graphics game filled with race-against-the-clock action, *Panic Button* is for you. In this 16K ECB game, your boss wants an order fully assembled and filled immediately or you are fired! In the beginning of the game, you choose which objects you wish to assemble, thus picking the desired skill level. The higher the skill level, the faster the conveyor belt moves.

Each object is dropped onto a moving conveyor belt in three pieces. Using your joystick, you must manuever your worker next to each piece and, by pressing the button, pick up and drop the three pieces on top of one another in proper sequence to make a complete object. Each piece or complete object moves along the conveyor belt to the bottom of the screen. You will get credit for each completed object that exits the screen.

To progress to the next skill/object level, you must assemble at least as many as the order requires in two minutes. After successfully completing two consecutive levels, you are given the exciting and well deserved chance to throw a cake at the nasty boss' face.

Sound easy? Precision, timing and dexterity are keys to the game. Once you break stride and the orders start passing you by, you quickly panic. Suddenly, pieces of unfinished objects fly around the screen, distracting you from completing your task. Some pieces will hit you in the head, while others just interfere with the production process. When you feel the tension build, maneuver your worker up and down over the Panic Button on the screen while you push the joystick button. The conveyor belt will stop for a brief time so you can assemble incomplete objects. But, the conveyor belt will begin moving again and your ugly boss' face will appear, making an annoying, grumbling noise. No doubt, it's a warning to get your butt in gear.



Panic Button provides colorful graphics, good sound and adequate instructions. The screen not only provides you with game play, but shows you how many orders you are required to complete, how many you have completed, the time and the Panic Button. At the bottom of the screen your score, skill level and highest score appear. The sound effects are a good adaptation of what each action really sounds like. For instance, when a piece of an object drops from the top of the screen onto the conveyor belt, a dropping "boop" sound is made.

The hardest skill to master is maneuvering your worker next to a piece and placing it on another. You usually get cake toppings or robot feet on your head as you run up and down the conveyor belt. I'm sure that gives the boss a hearty laugh.

One of the best features of *Panic Button* is that it is addictive. After the screen says "You are fired," you find yourself pushing the joystick button to play another round—especially if you have almost completed two rounds and have just missed the chance to throw that cake. The only aggravating part is, you must start from the beginning and, again, successfully complete two levels.

I thoroughly enjoyed *Panic Button* and think it is well worth the price. I recommend it to anyone who enjoys action-packed fun and sweet revenge.

(First Star Software, Inc., 22 East 41st St., New York, NY 10017, tape $24.95, cartridge $39.95)

—Susan Remini

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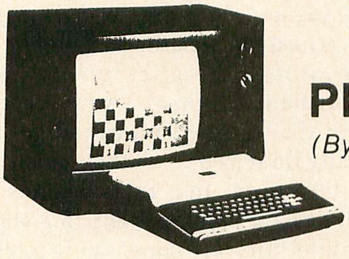

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This Flight Simulator Is 'The Right Stuff'

As I lowered myself into the cockpit of the F-16 fighter my heart raced with excitement. A quick check of the instruments and I was ready. I slowly pushed the throttle forward and the nimble craft leapt down the runway and into the air. Gear up, flaps us and I was away. I pulled back on the stick gently and lifted the aircraft into a near vertical climb. But wait, what's that you say? You're not in the Air Force and the closest you've ever been to the cockpit of a jet aircraft is the first class lavatory on a 727? . . . Not to worry, because now you can fly to your heart's content while still comfortably seated at your 32K Color Computer with KRT Software's *F-16 Instrument Flight Simulator*.

As an airline transport rated pilot, I have spent a considerable number of hours at the controls of jet aircraft and I can tell you that this is a very realistic simulation of jet flight. It is by far the best flight simulator I have seen for CoCo. Pilots will recognize it as realistic and non-pilots will learn a lot about instrument flying in particular and flying in general from it.

The graphics in this one are super. The instrument panel looks and functions like the instrument panel in a real airplane. I particularly like the attitude indicator, which to the uninitiated, will seen to be operating backwards when indicating a bank. This is not so. It functions exactly like the real thing, you just have to remember that you and the airplane are rotating around the horizon, not vice-versa. The panel is marked in blue and red and the sky outside the cockpit is blue. There is also a heads up display (HUD) that shows you where you are in relation to the runway and, once you are established on the instrument approach course, it becomes an ILS indicator complete with localizer and glide slope. This is where there is one of the few faults in the program. The glide slope gives you true fly toward the needle indications but the localizer is backwards; that is, you must fly away from the needle in order to center it and thus be lined up with the runway center line during an instrument approach. I would very much like to see this corrected, for it would make this simulation a very effective tool for real flight instruction.

One of the options this simulation provides is the ability to select elevator and aileron sensitivity so that you can tailor the aircraft's flight characteristics to your own skill level. At the higher levels the aircraft really becomes sensitive to small control inputs. You can also select a mode in which a closed triangular course is provided for you to navigate. There is also a a night flying option.

You can perform aerobatic maneuvers but there is a quirk here. Whenever you perform a roll or a loop you must perform the maneuver completely through 360 degrees. If you half-loop and then roll back to level flight the controls will be crossed. A split S will produce the same result. While in inverted flight, however, the controls are reversed just as they are in real inverted flight.

Gear and flaps function as in a real aircraft (be sure and power when you lower them because the aircraft will decelerate rapidly with them extended) and are controlled through keyboard inputs. One thing I noticed here is that the documentation says to press the "G" key to lower the gear but actually you must press the "D" key for gear down. After a landing information is provided in text form about the quality of the landing. If you should crash the screen goes crazy and then provides flight recorder data about the crash.

Two joysticks are required. I suggest the use of a spring center return joystick for the primary flight controls (aileron and elevator) as this gives some sensation of the liveliness of a real airplane's controls. A free-floating joystick should be used for the throttle so it can be positioned and left alone.

Finally there is one weakness that I, as a pilot, would like to see improved. In a real airplane, landings and descents (not dives) are usually made in a slightly nose up attitude, controlling aircraft speed with pitch attitude and rate of descent with power. This may seem strange to you non-pilots, but it's the way it's done (especially on landing). In this simulation if you place the aircraft in a constant nose level of nose up attitude it will maintain altitude or climb regardless of power setting or airspeed (unless you are below stall speed, then you drop like a brick). This makes touchdowns unrealistically difficult because you must touchdown in a slightly nose down attitude. It's less of a problem during an instrument approach but still slightly unrealistic as you must execute a shallow dive down the approach course and the only way to control speed is to hang out gear and flaps and use power. If this were corrected and the localizer indication corrected you would probably need a pilot's license to run this one.

Documentation is good and provides all the needed information to get you started on your flying career. The publishers also state that the program will be upgraded from time to time and that owners will be entitled to these upgrades at "little or no" cost. Let's see, if they added some visual (through the windshield) graphics and some combat features . . . Well, you could go on and on, but with the promise of future updates and the excellent program that already exists, this could only be called "the right stuff."

(KRT Software, P.O. Box 41395, St. Petersburg, FL 33743, $19.95, cassette)

—David Johnson

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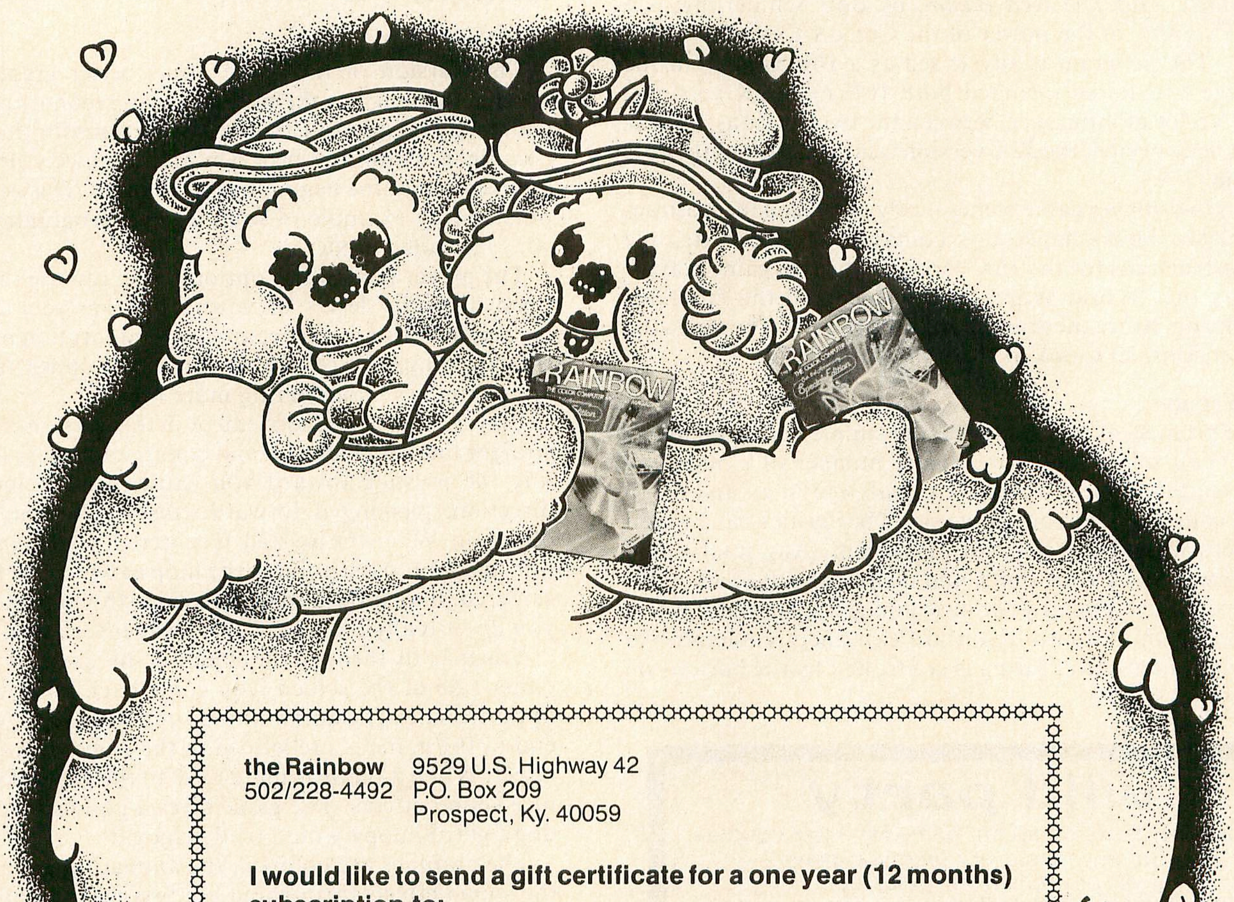

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Give Him Room And Snoopy Really Flies

Snoopy And The Red Baron, by Bob Schmerling, is a good example of the power of the CoCo's Extended Color BASIC. The program is advertised as a 16K game, but the package I reviewed included both 16K and 32K versions. There's a lot of difference between the two versions, and, as might be expected, the 32K version is far superior to the 16K version.

This two-player game comes nicely packaged in an attractive plastic book-shaped box containing the cassette tape and instructions for the 16K version. The two game players portray the "World War I Flying Ace" and the infamous Red Baron. Since there are so many differences between the two versions, let's look at them individually.

16K Version

The premise of this game is quite simple and straightforward. You select the approximate number of clouds you want scattered about the screen, grab a joystick and try to shoot your opponent out of the sky. The joystick can be used for both lateral and vertical movement. Any intervening clouds will block your shots, and if you run out of ammunition, you must land at your base and get resupplied. When you are in this situation you are extremely vulnerable to your opponent's fire. Firing is controlled by the buttons on the joysticks.

The clouds also impede your movements; for example, you can't fly through them, but must maneuver around them. The graphics are clean and colorful and while the animation is somewhat simplistic, it is well done within the limitations of 16K. The need to conserve ammunition and figure a path through the clouds to get your opponent within your sights provides an adequate challenge to the younger child, say up to 12 years old.

32K Version

This version of the game offers better graphics and a greater challenge to the players. I can recommend this version for ages eight to 108. The instructions for this game are contained within the program and are nicely presented at your option at the beginning of the game. This version is an outstanding example of what a good programmer can do with Extended BASIC.

The player has several options. You can use three predefined difficulty levels or you can define your own game parameters. For instance, number and location of clouds in the sky, range of fire, a jet stream in the upper limits of the screen (makes maneuvering more tricky).

Player control and movement in this version is either in a straight line, or clockwise and counterclockwise loops. Pulling the joystick toward you causes you to loop in one direction, pushing it forward causes a loop in the other direction. When the joystick is centered, you fly in a straight line, tangent to the point in the loop at which the joystick as centered. It's a little hard to get used to the controls, but once you do, it really is a nice way of maneuvering your plane.

You may fly through the clouds in this game. If you fly off either side of the screen, you come back into view on the opposite side. The ammunition supply is unlimited and the end of the game is predefined in the game parameters you select. When a plane is hit, it falls to the ground with some nice sound effects. The game gives a good simulation of a dog fight; Snoopy would really enjoy it!

The graphics are colorful, the animation is smooth, and the sound effects throughout are first-rate. I really enjoyed this version, and so did the kids.

If you've got 32K then I can recommend this package. If you've got 16K and children under 12, I still recommend it. Chances are, by the time your kids outgrow the game, you will have expanded to 32K and it will be like having an entirely new game. . . free!

(S&S Arcade Supplies, 8301 Sarnow Drive, Orlando FL 32807, 16K ECB cassette, $18.95)

–Randall Smith

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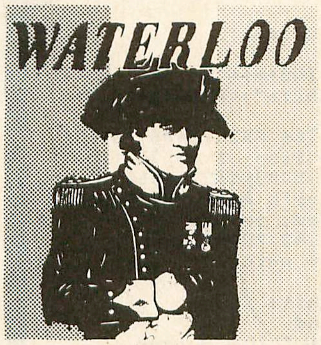

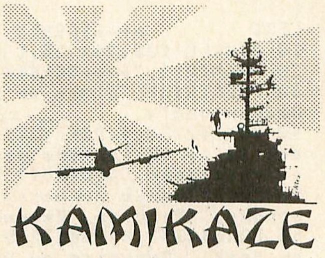

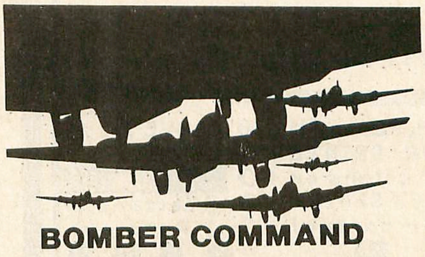

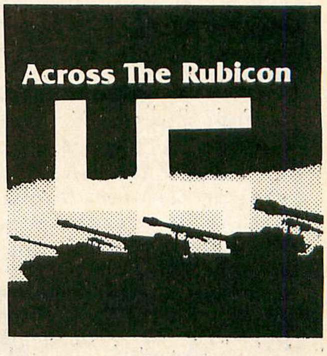

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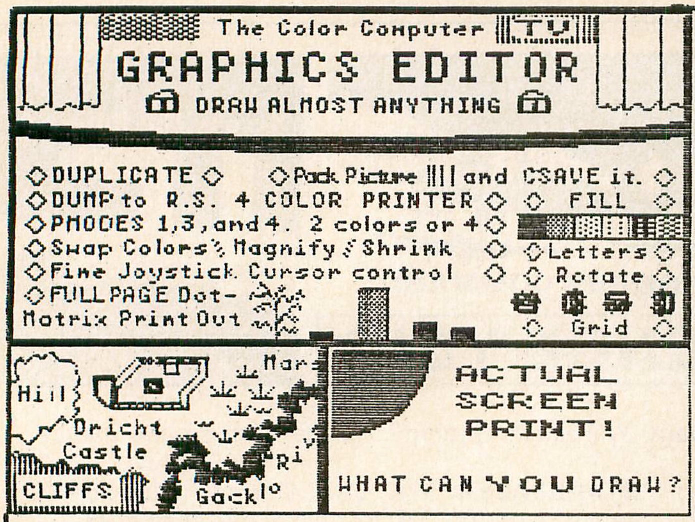
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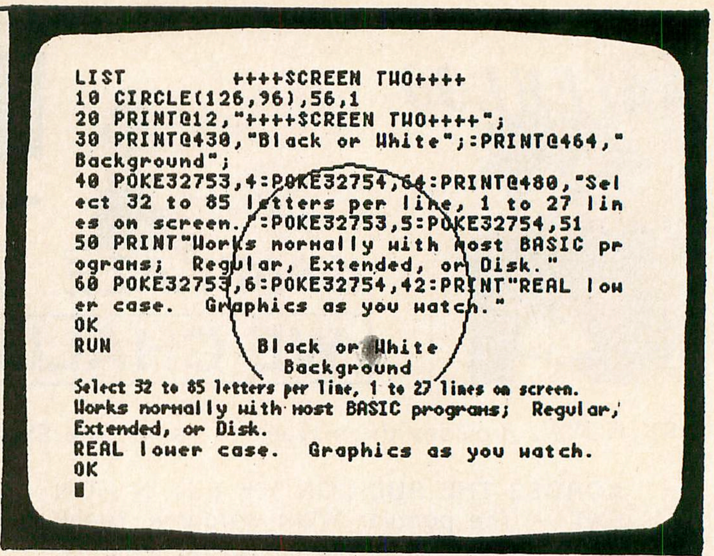

```
LIST           ++++SCREEN TWO++++
10 CIRCLE(126,96),56,1
20 PRINT@12,"++++SCREEN TWO++++";
30 PRINT@430,"Black or White";:PRINT@464,"
Background";
40 POKE32753,4:POKE32754,64:PRINT@480,"Sel
ect 32 to 85 letters per line, 1 to 27 lin
es on screen.":POKE32753,5:POKE32754,51
50 PRINT"Works normally with most BASIC pr
ograms;  Regular, Extended, or Disk."
60 POKE32753,6:POKE32754,42:PRINT"REAL low
er case.  Graphics as you watch."
OK
RUN                Black or White
                     Background
Select 32 to 85 letters per line, 1 to 27 lines on screen.
Works normally with most BASIC programs;  Regular,
Extended, or Disk.
REAL lower case.  Graphics as you watch.
OK
█
```

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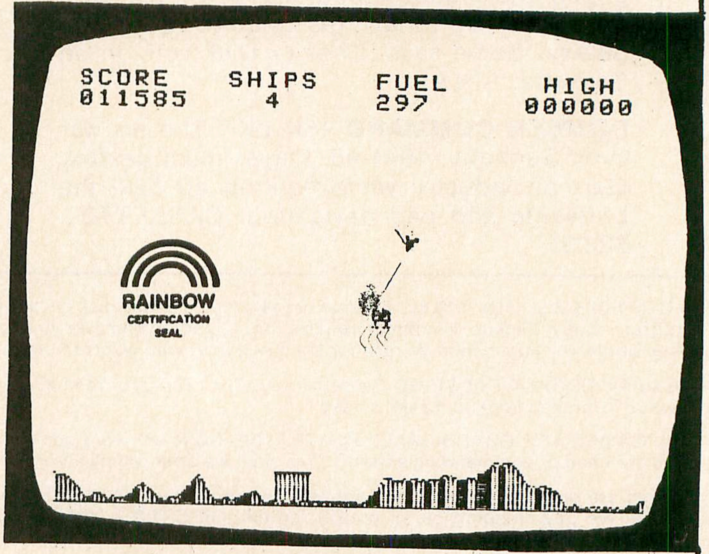
SCORE 011585
SHIPS 4
FUEL 297
HIGH 000000
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You've escaped the slave ship in *Beyond the Cimeeon Moon* and have taken the quest to return to the Mother Ship to destroy the Guardians, free your fellows, and return control of your civilization to sentient beings. You begin your adventure in the Mother Ship, your return is barred. You must kill or disable all Guardians on the Mother Ship, a task which could take years and require a whole army of your brethren.

Does this sound like an exciting scenario for a good arcade game? Well, it is! But, it is more than just an arcade game. It is also an adventure game.

I must admit, I do not like arcade games very much, because they never hold my interest for long. When I received *Fembot's Revenge* for review, I said to myself, "Another arcade game!" To my surprise, I was wrong. True, it has some good shoot-em-up sequences, but the majority of the time, it's like an adventure game.

You must travel through the ship finding discs, opening doors, and destroying the Guardians. When you have killed all of the Guardians on one level, you will be transported to the next level only to find yourself having to destroy more Guardians.

One of the real challenges in this game is solving the riddle of the destruct button. If you find this button, you can instantly destroy all of the Guardians on the floor and advance to the next level.

The following are some of the features worth noting in this game: 3-D graphics (the graphics are excellent and realistic), a "hyperspace" flash belt, a special geiger to find the destruct button (believe me, it doesn't make it that much easier to find it), variable placement of objects after each level, and a detailed inventory of the player's status. This game is played in "real time," so if you just stand there thinking, you will increase your fatigue level. All of this, and periodic battles with Guardians make this a very exciting game.

(ColorQuest Games, A Division of Softlaw Corp., 9072 Lyndale Ave So., Minneapolis, MN 55420, 16K tape $29.95, 32K disk)

—Paul Lee

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STAR — KIBBITS

My dictionary defines 'deja vu' as the mistaken feeling that you've seen something before, when you really have not. But if you had the feeling last month that you had seen my Kibbits chat before, it wasn't deja vu! You really did see it — the month before that. As you can imagine, writing a new column each month can get somewhat hectic, especially as the deadline approaches... and passes. If this were just a plain article, the magazine could simply put in a note like "Mr. Stark's column will not appear in this issue, and will resume next month." But with an advertisement it's not that simple. I suppose we could have left this space empty...

STAR-DOS PRICE REDUCTION

Our STAR-DOS 64 has had such a good reception that we have decided to permanently drop the price. From now on, the regular STAR-DOS (for 16k and 32k systems) and STAR-DOS 64 (for 64k systems) are being bundled together into a single package which we will call STAR-DOS, and which will have the combined price of $49.90.

Despite the release of OS-9 (a trademark of Microware Systems Corp.) and Flex (a trademark of Technical Systems Consultants) for the CoCo, we expect the popularity of STAR-DOS to keep rising for two very simple reasons. First, STAR-DOS is the only DOS which supports the standard Radio Shack CoCo disk format. Though we all hear about the large amount of software available for Flex and OS-9, the fact of the matter is that there are more programs available for the standard CoCo disk format than for OS-9 and Flex together.

Second, since OS-9 and Flex are also incompatible with regular CoCo Disk Basic, you must buy another Basic to get their full benefits. Not so for STAR-DOS, which can read and write the same files a Disk Basic can.

There is a good number of serious users of STAR-DOS among you; in fact, we have even licensed STAR-DOS to other software developers for inclusion in their own products. We're so enthusiastic about the future of STAR-DOS that we're willing to make you an offer you can't refuse: If you now have a DOS, any DOS for any machine, send it to us and we will trade you for a copy of STAR-DOS. Please — original documentation and disks only, and include $3 for shipping.

To know STAR-DOS is to love it!

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If so, then you may be interested in a VFR Flight Planning program for the CoCo, available for $24.95 for tape, or $29.95 for disk, from Frank Lombardi, P.O. Box 373, South Salem, NY 10590.

That's it for now — see you next month.

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Monkeying Around With *Junior's Revenge*

If you have ever played the popular arcade game, Donkey Kong, Jr., then you won't have any trouble playing Computerware's *Junior's Revenge.* The 32K machine language CoCo version contains all four graphic screens, like the original game.

If you aren't familiar with the game at all, here is a brief background. Junior is a little gorilla, trying to save his father from the clutches of Luigi. Luigi is a little red-haired construction worker, who in an earlier version of the arcade game, saved his girlfriend from an unsavory ape, Junior's father, and locked him in a cage. *Junior's Revenge* now adds new challenges to the original concept. You are no longer at a construction site trying to save your girlfriend from a gorilla. Instead, as a monkey, and proud son of Kong, you are deep in the jungle attempting to rescue your encaged papa.

There are four distinct boards of play: the Vine Screen; the Chain Screen; the Trampoline Screen; and Luigi's Hideout Screen, each appearing in a planned sequence. In the Vine Screen, your father is captive in his cage on top and you are ready to go at the bottom. You begin the game with four men and your objective is to swing from vine to vine, climb to the top, and get the key from Luigi and save your father. This would be a simple task except for the trained animals the revengeful Luigi has sent out to stop you—the "vinegators." They move up and down the vines seeking to kill, and any contact with them will destroy you.

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You control the movement with the right joystick and jump by pressing the joystick button. You can either shimmy on one vine, or climb by using two vines, one in each hand. I found that climbing two vines is the quickest method to go up, while sliding down with one vine in both hands is the fastest way to descend.

Time is an important factor in this game because of the bonus timer in the upper right corner of the screen. If your bonus time runs out before you get the key from Luigi, you lose. Points are obtained by grabbing fruit from the vines along the way, or destroying the vinegators by patiently waiting until the vinegator is underneath the fruit and then nudging the fruit loose, causing it to fall and crush the vinegator.

Timing is the key to successful fruit dropping and vinegator killing. It takes a lot of practice to do this successfully every time. After completion of this screen, the amount of points left on the bonus timer is added to your score and you will then be able to proceed to the Chain Screen.

In this screen, your main objective is the same: to free your father. The Chain Screen is made up of eight long chains of equal length. At the end of six of them there is a key. You must push the keys up the chains and force them into locks while avoiding vinegators and trying to again destroy them with the fruit. Another enemy to watch out for is the ZuZu birds, which move horizontally across the screen descending in zigzag fashion. Any contact with the ZuZu's will cause them to peck you until you fall to your death. They also proceed to the bottom of the screen and if you jump over them you will receive extra points. When I got to this screen of play I had a lot of difficulty. I could not complete the screen without falling to my demise.

In playing *Junior's Revenge,* it took a lot of practice in getting accustomed to the maneuverability of the joystick. I fell a number of times by not jumping just right or not having the joystick pointed in the proper direction. A nice feature of *Junior's Revenge* is its practice mode. By playing a practice game, you can figure out the manner in which the game is operating and learn the skills of the game without being destroyed by one of the creatures. You can only be destroyed by falling and your high scores are not kept in the top five. I found the practice mode to be a gratifying way to learn the game and its joystick movements. There's nothing I dislike more than finally getting the hang of a game and then being told: GAME OVER.

The sound effects in *Junior's Revenge* are pleasing and the graphics are fantastic and full of color. Consider the excellent graphic quality of *Junior's Revenge* as an example of the Color Computer's capability. *Junior's Revenge* lays to rest many of the claims I've heard of Atari's graphics superiority to the CoCo.

The Trampoline Screen and Luigi's Hideout Screen are a mystery to me because I have not yet been able to successfully reach them. I am sure that someday I will get to these screens and save my father from Luigi. I may have to read one of those booklets on how to beat computer games, but, the point is that *Junior's Revenge* is that challenging and that much fun to play. Several games that I have played were too easy, which caused me to lose interest after easily defeating them.

(Computerware, P.O. Box 668, Dept. F2, Encinitas, CA 92024, 32K tape $28.95, 32K disk $31.95)

—Jutta Kapfhammer

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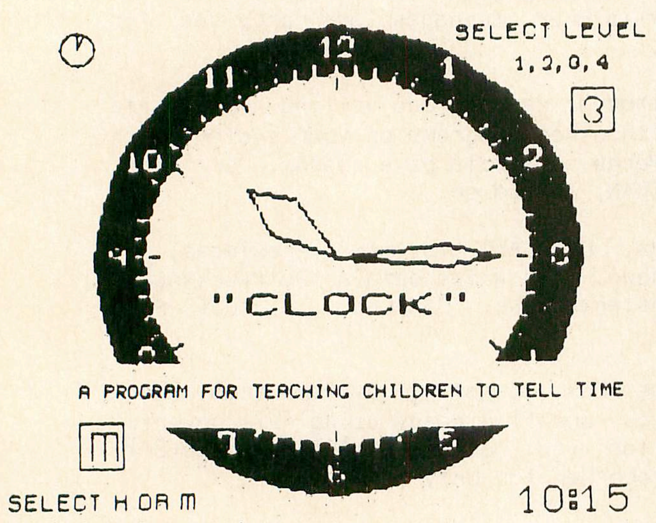
Here, A Pen Is Mightier Than Stick

You will find that this product review is somewhat unusual. For this review, I constructed a somewhat unique test program and a keyboard modification. Let me get the usual "what it does and how well" questions out of the way first. The Light Pen from Colorware is an alternate form of input that can be used with educational programs, games or experimentation. The Light Pen attaches to the joystick port and uses the digital-to-analog converter to change light intensity to a value that can be read by the "JOYSTK" command. The pen reads the intensity of light when touched to the video screen.

The pen comes with sample programs and adequate documentation to allow you to construct your own programs. To construct your own programs, you need some knowledge of BASIC but do not necessarily have to be an expert. When The Light Pen is used, a graphic block must be flashed when a location on the screen is being sensed. I would expect that this flashing graphic block may cause some problems for some individuals but found that this was not a particular problem for the severely handicapped students that I teach. The size of the flashing graphic block may vary according to the size and illumniation of the TV screen or monitor being used. In general, the block must be at least the size of a low-resolution graphic pixel.



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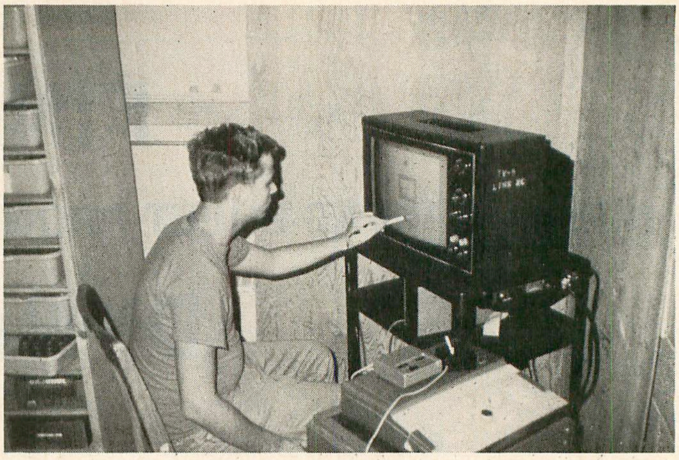

When I used The Light Pen with an educational program with handicapped students, I did note two problems. Some students moved the pen very slowly across the screen and would sometimes select a wrong answer by mistake while moving towards the correct answer. In other instances some students would leave the pen on one answer selected longer than required and the selection would be given again by mistake. Perhaps these problems could be overcome by more creative programming, but these types of selection errors are a consideration. The light in a well-lighted classroom could cause an unwanted reading if the pen is directed towards the light.

On the positive side, there were several individuals that could correctly answer questions when using The Light Pen and could not answer correctly by other methods such as using the keyboard or a joystick. After ruling out these types of misreadings, I found that most, if not all students appeared to perform better with The Light Pen. There appears to be a more direct correlation between the action of selecting an answer and the position of the answer on the screen.

In general, I feel that there are some excellent reasons for using a light pen with handicapped individuals or young children, as well as for those who simply like to experiment with an alternate form of input for the computer. The price of The Light Pen ($19.95) is very reasonable. I would suggest that The Light Pen is a "must have" tool for those who use computers with handicapped young children. The Light Pen does have some weaknesses but for the price it is difficult to pass up.

* * *

Now, let's look at a unique test of The Light Pen. To thoroughly test it, I constructed a test program and some keyboard modifications (see Listing 1). The program presents a key word framed in the center of the video screen. This word is selected at random from the words, "TOP, BOTTOM, LEFT, and RIGHT." Each of the words is then placed around the peripheral of the screen at the appropriate location. The task is to select the word that matches the word in the center frame. Students were given 20 trials each with five different methods of selecting the appropriate word. The methods tested three forms of input (ways the answer could be chosen) and two different screen formats (what appeared on the screen). These methods are described below:

1) Light Pen — The student would select the answer by touching a flashing graphic box below the answer with the light pen.

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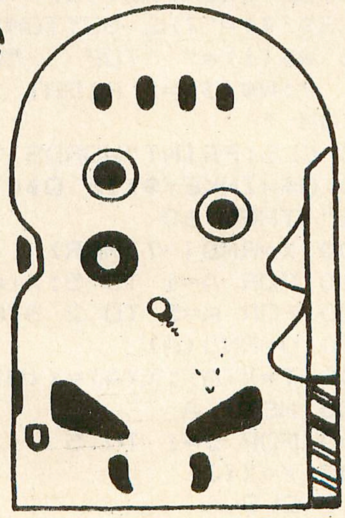

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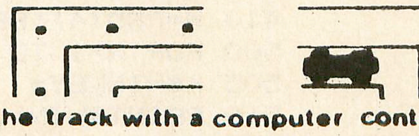

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2) Modified Keyboard — I constructed a modified keyboard by covering the keys with a piece of plexiglass with four selection keys. The student would select the answer by touching the key in the same relative position as the appropriate answer on the screen (see picture).

3) Joystick — The students would select an answer by moving the joystick in the direction of the appropriate answer. The position of the joystick is shown by a red flashing block on the screen (under one of the answer words).

4) Modified Keyboard with screen flash — This is the same as Method 2 except that the flashing white graphic block was shown under each answer. This was done to determine if the flashing block (which must be used with The Light Pen) has a distracting effect.

5) Joystick with screen flash — The method of selection was the same as for number 3 but a flashing white graphic block was added to the screen.

The students using the program are "trainable or severely mentally handicapped students." Their average reading level is below second grade and some students neither read nor communicate verbally. Every student used all five of the methods. The order in which methods were presented was selected at random.

On the average, students gave the most correct responses with the modified keyboard. The flashing of a graphic block had little effect. Students gave the least correct responses with the Joystick Method and again the flashing had little effect. Although The Light Pen was less effective than the modified keyboard for the average of the group, there were several individuals who could answer correctly with The Light Pen but were considerably less successful with any of the other methods. It appeared that most if not all individuals could best understand the method of selecting an answer when they were using a light pen. However, some students trailed over incorrect answers when selecting an answer and would leave The Light Pen on an answer long after the time required to make a selection. This would result in inadvertent selection of answers and lower scores than was obtained for the modified keyboard method.

Students had the greatest difficulty with the joystick. Students tended to move in the general direction of the correct answer but were not precise enough to make a cor-

The Listing:

```
250.....02B8
540.....058B
END ...081D
```

```
1 CLS
4 PRINT#-2,"":PRINT#-2,"--------
-----------------------"
5 INPUT"WHAT IS THE NAME"; N$:PR
INT#-2,N$
6 PRINT #-2,"-------------------
------------"
10 L(1)=78:L(2)=227:L(3)=251:L(4
)=430
15 WS$(1)="A TOP ANSWER":WS$(2)=
"GOOD JOB":WS$(3)="RIGHT ANSWER"
:WS$(4)="THE BOTTOM LINE"
20 W$(1)="  TOP   ":W$(2)="  LEF
T  ":W$(3)=" RIGHT  ":W$(4)=" BO
TTOM "
50 CLS:PRINT"WORDS ?  Y/N"
60 Q$=INKEY$:IF Q$<>"Y" AND Q$<>
"N" THEN 60
100 X=RND(-TIMER)
110 FOR A=1 TO 5:X(A)=A:NEXT
120 FOR A=5 TO 2 STEP -1
130 U=RND(A)
140 T=X(A):X(A)=X(U):X(U)=T
150 NEXT A
200 FOR J=1 TO 5
205 X=X(J)
210 CLS
220 ON X GOSUB 240,250,270,260,2
80
225 PRINT:PRINT"PRESS ^ WHEN REA
DY"
230 X$=INKEY$:IF X$<>"^" THEN 23
0 ELSE 300
240 PRINT@232,"PEN":PRINT#-2,"PE
N":RETURN
250 PRINT @232,"KEY FLASH":PRINT
#-2,"KEY FLASH":RETURN
260 PRINT @232,"KEY NOFLASH":PRI
NT#-2,"KEY NOFLASH":RETURN
270 PRINT @232,"JOYSTICK FLASH":
PRINT#-2,"JOYSTICK FLASH":RETURN
280 PRINT @232,"JOYSTICK NOFLASH
":PRINT#-2,"JOYSTICK NOFLASH":RE
TURN
300 CLS
310 IF X<4 THEN W$=CHR$(207)+CHR
$(207):B$=CHR$(240)+CHR$(240) EL
SE W$=CHR$(143)+CHR$(143):B$=W$
320 IF Q$="Y" THEN PRINT@L(1)-32
,"TOP":PRINT@L(2)+30,"LEFT":PRIN
T@L(3)+31,"RIGHT":PRINT@L(4)+31,
"BOTTOM"
330 PRINT@171,STRING$(10,175);
340 FOR A=1 TO 3:PRINT@A*32+171,
CHR$(175);STRING$(8,143);CHR$(17
5);:NEXT A
350 PRINT@32*4+171,STRING$(10,17
5);
390 TIMER=0
400 FOR Q=1 TO 20
410 W=RND(4):PRINT@236,W$(W);
500 FOR N=1 TO 4
505 K$=INKEY$
510 PRINT@L(N),W$;
520 FOR D=1 TO 10:NEXT D
530 LP(N)=JOYSTK(0)
535 IF JOYSTK(3) <20 THEN JS=1 E
LSE IF JOYSTK(3)>40 THEN JS=4 EL
SE IF JOYSTK(2)<20 THEN JS=2 ELS
E IF JOYSTK(2)>40 THEN JS=3
537 IF X=3 OR X=5 THEN PRINT@L(J
S),STRING$(2,191);
540 IF K$<>"" THEN K=INSTR("6DKB
",K$):IF X=2 OR X=4 THEN 700
```

rect selection. They tended to ignore the information on the screen while they were making a selection. The program kept track of the total amount of time required to respond to 20 questions. Students responded fastest with the light pen and slowest with the joystick. The joystick selection method was significantly slower for this group of individuals and the light pen was only slightly faster than the modified keyboard. It might be expected that these results are only typical for a handicapped population.

As a result of this study, I believe that I can recommend The Light Pen as a method for handicapped students to select answers for educational software. Certain students were more successful with this method than with other methods. However, the modified keyboard appeared to provide the most reliable method for students to respond.

(Colorware, 70-03 Jamaica Ave., Woodhaven, NY 11421, $19.95)

—Dr. Charles H. Santee

```
545 PK=PEEK(65280):IF (PK=125 OR
 PK=253) THEN IF X=3 OR X=5 THEN
 690
550 PRINT@L(N),B$;
560 NEXT N
570 AV=(LP(1)+LP(2)+LP(3)+LP(4))
/4
580 FOR N=1 TO 4
590 IF LP(N)>AV+3 THEN AV=LP(N):
Z=N
600 NEXT N
610 IF Z=0 OR X<> 1 THEN 500
620 LP=JOYSTK(0)
630 PRINT@L(Z),W$;
640 FOR D=1 TO 10:NEXT D
650 IF JOYSTK(0)<LP+5 THEN 500
680 GOTO 700
690 PK=PEEK(65280):IF PK=125 OR
PK=253 THEN 690
700 IF X=1 THEN SL=Z ELSE IF (X=
2 OR X=4) THEN SL=K ELSE SL=JS
710 IF W=SL THEN RT=RT+1:PRINT @
0,WS$(SL);:SCREEN 0,1:PLAY"T4L8O
2CDEFGABO3CDEFGABO4CDEFGAB":PRIN
T @0,"                          "
730 IF W<>SL THEN WR=WR+1:PLAY"T
4L4O3CO1C"
740 NEXT Q
741 TI=TIMER/60
745 PRINT#-2,"PERCENT = ";100*(R
T/20);"%":PRINT#-2,"     ";TI;"SE
CONDS":PRINT#-2
746 RT=0
750 NEXT J
760 RUN
1000  K=INSTR("6DKB",K$):IF K<>0
THEN 700
1010 GOTO 545
```

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Rainbow's Corner Is Educationally Enriching And Fun For Children

By Carol Kueppers

Rainbow's Corner is the title of a group of learning programs, as well as the title of one of the games. Two of the activities are designed for two or more players; one may be used either alone or with others; and four are for one person. These programs are primarily intended for use by children from five to 11 years old. Although older children will enjoy them, they will not be as challenged. Several of these activities use the computer to help teach problem solving skills and are a welcome change from the now all-too-common drills.

In the game *Rainbow's Corner*, the object is to find the gold located somewhere in the castle of the Blue Snorgle. At the start of the game, the player has five gold pieces and the castle is represented by a large rectangular grid, divided into rooms, with the X and Y coordinates given along the sides. The player specifies the room he wishes to enter by typing in the proper coordinates, separated by a comma.

If he hears a sound the player is near the Gold-Gobbling-Grouch, and should seek elsewhere. If he enters the room of the Grouch, he hears a high pitched sound and one of his gold pieces is taken. The Grouch then enters another room, one that the player has not yet entered.

As rooms are entered, they are colored in. Further clues are given to the player as he progresses from room to room. The word *Vikes* on the screen indicates gold is near, while *Ho-hum* tells him that he is neither near the gold nor the Grouch.

The game is very effective in teaching the use of coordinates to specify location, and helps develop problem-solving skills. Any child who has learned to read a few words can play, with its appeal greatest among the younger group. Once children have become used to this system through the game, parents and teachers can show children the use of coordinates on maps and graphs in the everyday world.

I feel this game is excellent; however, because it is intended for use with children, I should like to suggest that the author correct some minor imperfections. Should a child inadvertently press [ENTER] before he has entered the coordinates separated by a comma, the screen scrolls. This places perhaps too great an emphasis on following the directions exactly. Also, in the on-screen instructions, the word "it's" is used to denote possession. Any parent could easily correct the latter before making a back-up copy.

Wraparound is a word game which can be successfully played by children from the time they have learned to read a few words. One child types in three words, each of which must have between four and 12 letters. His opponent is then shown the word "wrapped" on the screen in two rows of letters, with the initial letter somewhere in the group. The word is not scrambled, so that once the initial letter is found the player reads around and types out the rest of the word. He has three tries, and when successful, the letters are pulled from the block, and a colorful graphic display is shown. In addition to scoring points based on which try was successful, a bonus is given for speed.

This game can be used successfully in the home between parent and child with new vocabulary and spelling words. However, when two children play together trying to trip each other up, the game takes on a whole new dimension. Then, each seeks out unusual words and the contest encourages the learning of new words.

In *Alien Codes,* which is also for two or more players, one player types in a series of words—which can be random or part of a phrase—with a maximum total of 25 letters. These are then shown to his opponent in a box in the center of the screen, with no spaces between the letters, starting at a random location in one of the words.

As in *Wraparound*, the words are not scrambled and the phrase proceeds in order. The game is to move the arrow keys over the initial letter of each word and press the space-bar. If the letter is the correct starting letter of a word, a black box remains there and the player seeks the initial letter of the next word. Should he want help, pressing H will tell him the number of words chosen by his opponent. Speed is important here as he has only a limited time to find all the words.

The manual includes a story for the game, while the screen display shows the time remaining, score, and hints in the boxes, as an instrument display of the "spaceship." These graphics add to the fun of the game. Because this game deals in a group of words together, it is more difficult than *Wraparound.* The child can *graduate* to *Alien Codes.* Again, a parent can enter the child's reading and spelling words, or key phrases, but when children play together, if they are like

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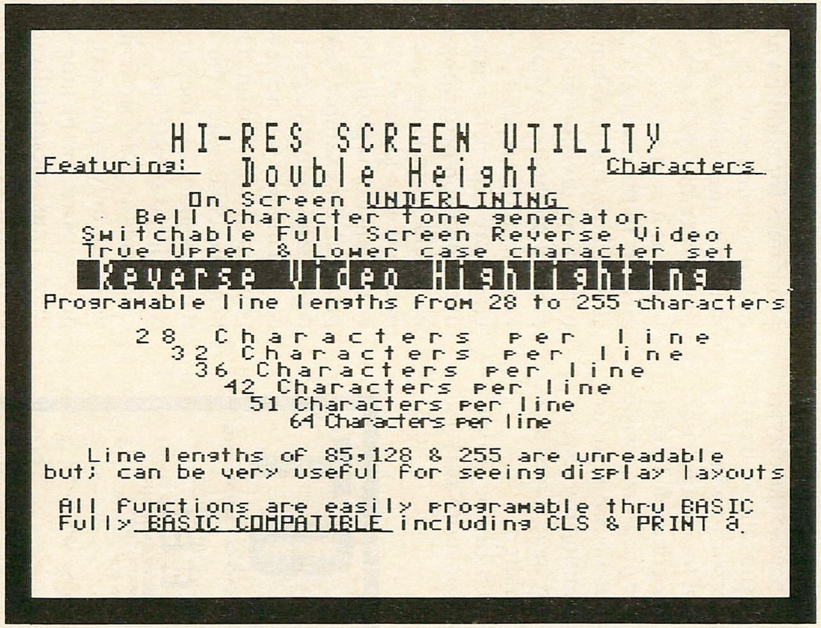

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my testers, they will try to fool the others with unusual combinations.

Gulp! is a terrific arcade-style game, which can only be played after successfully answering a simple addition problem. The answer to the addition problem is given in a number line beneath the problem, so the child just learning to add can count the squares in the number line.

After each correct answer, the answer is placed in a center box, and the player is given a chance to play *Gulp!* a Breakout style game, trying to get to the center square before the computer's "greedy gulp worm" gets to it. The player has a blue "mite" and is presented with a series of walls made of colored bricks. The mite moves up and down and breaks throuh a wall when the player presses the spacebar.

Each brick color has a different score value, so that, for a maximum score, the player must wait until his mite is opposite the brick he wants to break through before pressing the spacebar. If he presses the spacebar while next to an orange brick, the computer's worm advances. When the mite is at the last wall, the worm continues his advance, so the player should have his mite lined up before he breaks through this final wall and must quickly press the spacebar to win.

The game is challenging and a lot of fun for all ages, not only those who are learning the number line concept. To add to the educational value of this number line program, I wish the author had included a choice of arithmetic problems at different levels for different age groups. Among my testers, everyone loved the game, and it could easily have served as a reward for difficult problems for older children.

Pears, Berries and Figs is a game which can be played either against the computer or with two or more players. One player types in a two-digit number for the other(s) to guess, or the computer chooses a number. The other player(s) then type in a two-digit number. If neither digit is correct, two Ps, for pears, are shown in the column adjacent to the number selected, if one is correct, but in the wrong location a PB is shown for pear, berry. If one is correct and in the proper location, a PF would be shown, for pear, fig. Unlike *Mastermind,* the position of the F does not indicate that the digit which is correct is necessarily in that position, although it may be. All previous guesses are shown on the screen, with the result for each so that the correct answer can be deduced.

The game fosters deductive reasoning in a way that is fun. Although, as a one-player game, *Pears, Berries and Figs* can only be played against the computer, once groups of children have learned it, it can be played without the computer as a paper and pencil game on car trips.

This tape also includes two "math utilities." These are intended as a means for kids to check their homework. One program is for addition and subtraction, the other for multiplication and division. In the addition, subtraction and multiplication utilities, the problem is typed in followed by the answer the child obtained. If the answer is correct he is told that it is; if wrong, he is immediately shown the correct answer. In the division utility, if his answer is incorrect he is shown how the problem should have been solved by the usual long division method. Although some teachers and parents might like to have the children correct their homework with this type of program, simply so that the children gain more experience using the computer with the exception of the division program the child learns nothing more than he would from using a calculator. To have real merit, the program would need to include teaching hints after the wrong answer is given. This would include, in an additional problem, for example, asking the child to think and add the right hand column again with the computer stating if the correct answer was achieved, then asking if a number needs to be carried, and so on. The potential to use the computer to help the child reach the correct answer is not utilized by these programs, so they are the weakest in the group from an educational standpoint.

Parents are advised that they will want to make a back up tape, not only to preserve the original, but also because the programs are on the tape with only a miniscule gap between them. Thus, successfully locating the start of all but the first program without obtaining an I/O Error is more difficult than it should be. Children simply do not have the patience to wait for a whole tape to play in order to load the one program they want.

The tape is accompanied by a spiral-bound manual which includes stories for the *Rainbow's Corner, Gulp!* and *Alien Codes* games, explicit instructions for use of all the programs, as well as a section for teachers and parents. This is well thought out, complete, and shows the care taken with the programs.

In the front of the manual is a page indicating that school children helped develop these programs, and I believe it. Children do have fun with all of them. Because I believe that only those educational activities which children enjoy will actually be used, these rate highly. In addition, their suitability for a broad age range makes this a tape which will be used over a long period of time.

(Rainbow's Corner, 2901 Mirante Ct., Richmond, CA 94803, tape $19.95)

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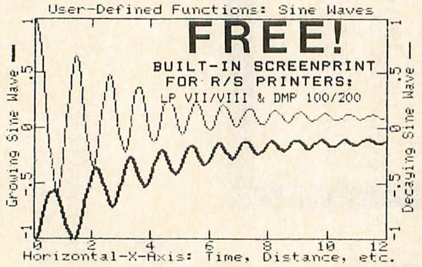

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P:Z=X+Y:PRINTZ:NEXTY:NEXTX
```

Into this: –
```
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           FOR Y = S TO P:
               Z = X + Y:
               PRINT Z:
           NEXT Y:
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```

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Stellar Search
Keeps On Treking

"To boldly go where no man has gone before." Thus began each episode of the weekly television series Star Trek. Owl-Ware's newest game for the CoCo, *Stellar Search*, is based on this series and allows you, the player, to actively participate in an Adventure simulating one of these episodes. Unlike many other "Trek" games on the market, *Stellar Search* tells a story, and it is this that my family and I found most satisfying.

The game itself is written in Extended BASIC with machine language data files and subroutines, and requires a 32K Color Computer. *Stellar Search* is comprised of five separate programs (including the introduction) and contains about 86K worth of programming. The four-page instruction booklet gives you all the necessary information to get started, but 80 percent of what you will need to know about playing is contained in the programs themselves. In fact, I had to play a couple of the games several times before I could avoid having the Enterprise shot out from under me in the first few minutes.

Before giving you an idea of what is involved in each program, there are several general points of interest that should be mentioned. Each program is loaded via *CLOADM* which uses the *AUTORUN* program marketed by Sugar Software. At the beginning of each program you are asked to set the "false color" mode in PMODE 4 by a simple Y or N response. Most other games I have played require you to reset the computer several times until the colors are satisfactory. Owl-Ware has done its homework on the "vitamin E" speed up *POKE*, and asks you if your computer can handle it or not, thus enabling the program to run on all system configurations.

Now into the programs themselves. The first program is an all text introduction and briefing of your mission and sets the mood for the following games. I will not describe the story itself, since much of the fun is seeing the plot unfold. Just keep in mind that each game is a continuation of the preceding one and all lead to a final conclusion in the fifth program.

The second program bears the greatest similarity to other Trek-type games in that you travel about on a grid from one quadrant ot another, fighting Klingons, avoiding black holes and refueling at various star bases, among other things. The graphics in this game are very well done and make the game that much more interesting. The most important thing to remember in this and the following programs is to use the [H] HELP key freely. This key gives you all possible commands for a given situation and since the commands differ from one situation to the next, it is a must to continually check your options.

The third program is the truest graphic Adventure program of the lot. The graphics in this one are the most impressive of all. The game itself is a puzzle requiring you to issue a specific set of commands in a specific sequence. Each command produces a graphic result, which either helps or hinders your mission.

The fourth program is an all text Adventure similar to many other Adventures, except that you provide one letter commands to direct your computer alter ego in his mission. Some of the commands, such as [U] for USE will cause the program to respond with "USE WHAT?" for which you then enter the item to be used. All in all, I would probably consider this a novice level Adventure.

The final game is really three arcade type games in the same program. The first and most difficult involves landing the Enterprise's shuttle craft on a planet whose mountainous terrain must first be flattened using anti-matter bombs. Since the game was written mostly in BASIC, the keyboard controls are somewhat sluggish and, although there are four levels of difficulty, we couldn't succeed even at the easiest level. To continue on to the next phase of this game required a little cheating. For those of you who get as frustrated as I do, *RUN* the program and [BREAK] when the first phase begins. Then enter GOTO37 and you will be placed at the next phase. This second phase involves manuevering your shuttle into orbit about the planet while avoiding semi-intelligent space mines. Once past this, you will proceed to the final phase, docking with the Enterprise.

To summarize my review, I would say *Stellar Search* provides a varied gaming experience and would be a good program for beginning level adventurers of all ages. My son, age 14, enjoyed playing the games and has returned to play them again several times. For myself, age 30+, I enjoyed it the first time, much as I would a good book, however, as with many Adventure games, once solved, they tend to be put on the shelf. One thing I do know, is that whenever company shows up at the house, this series of programs is one of my first choices to demonstrate my CoCo's graphic capabilities.

(Owl-Ware, P.O. Box 116H, Mertztown, PA 19539, Tape $27.95, Disk $30.95)

—Ken Boyle

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Cassette Controller Gives Total Control

The most time-consuming process of all cassette players is locating that special program on cassette. If you have ever experienced an I/O (input/output) Error, you know of the frustration involved in searching for the beginnings of programs when there are five or six programs on a cassette. There are only a few ways to solve this problem: to type in AUDIOON:MOTORON or unplug the jack to the cassette player which would then enable you to hear where your programs start and end; to only record two or three programs on a cassette which is very costly and wasteful; or to write the title the program was saved under and the counter position on the cover form provided with the cassette every time you save a program to tape. These methods mentioned can take up a lot of the computer operator's time that could be used more wisely.

A more appropriate method has been marketed to make program searching easier. Vidtron has recently released a handy tool, the Cassette Controller, a hardware item which gives you total control of cassette operation without unplugging cables. By the flip of a switch, the Cassette Controller makes the electrical connection in the remote line that allows the cassette player to turn on and enables you to hear your cassettes.

The Cassette Controller is a 3" x 2" x 1½" hard plastic box with a small built-in speaker and a six-foot spiral cord which simply plugs directly into the cassette port of the computer. The original cassette cord plugs directly into the Cassette Controller. There are two knob settings, either *Auto,* for normal computer/cassette operation, or *Manual,* which allows you to hear the cassette playing for total control of what you may use your cassette recorder/player for—without unplugging cables. When the Controller is set on the Manual position, it can be used to avoid unplugging cables on some standard cassette players and for listening for the beginners of computer programs. It can also be used to play or record music regardless of whether the computer is on or off.

The Cassette Controller is a nice accessory to own if you are using a cassette player other than one supplied by Radio Shack. Some standard cassette players require that you unplug the remote jack on the cassette player every time you want to go forward, fast forward and, in some cases, rewind. Although, some cassette players have been modified to rewind whether or not the remote jack is in, others still require you to unplug cables simply to rewind cassette tapes. The Cassette Controller will help combat these problems and prove to be an asset if you own one of the older standard models.

For those of you who don't allow the children to use your sophisticated stereo equipment for playing cassette tapes or recording, you can now let them use the computer cassette player with the turn of a switch on the Cassette Controller, and without unplugging cables, play and record safely and unsupervised.

If you don't mind the hassle of entering extra commands or unplugging cables to listen for beginnings of programs, or in some cases to rewind, go forward, or fast forward on the cassette player then the Cassette Controller is probably not the most likely item on your list of things to purchase. However, it can be a useful item for helping organize your computer area and for avoiding the unnecessary cable switching when you wish to find the beginnings of programs.

I like the Cassette Controller because it is convenient and simple to use, serves several purposes and consistently works without fault.

(Vidtron, 4418 E. Chapman Avenue, Suite 284, Orange, CA 92669, $25)

—Jutta Kapfhammer

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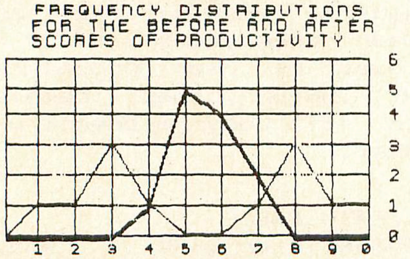

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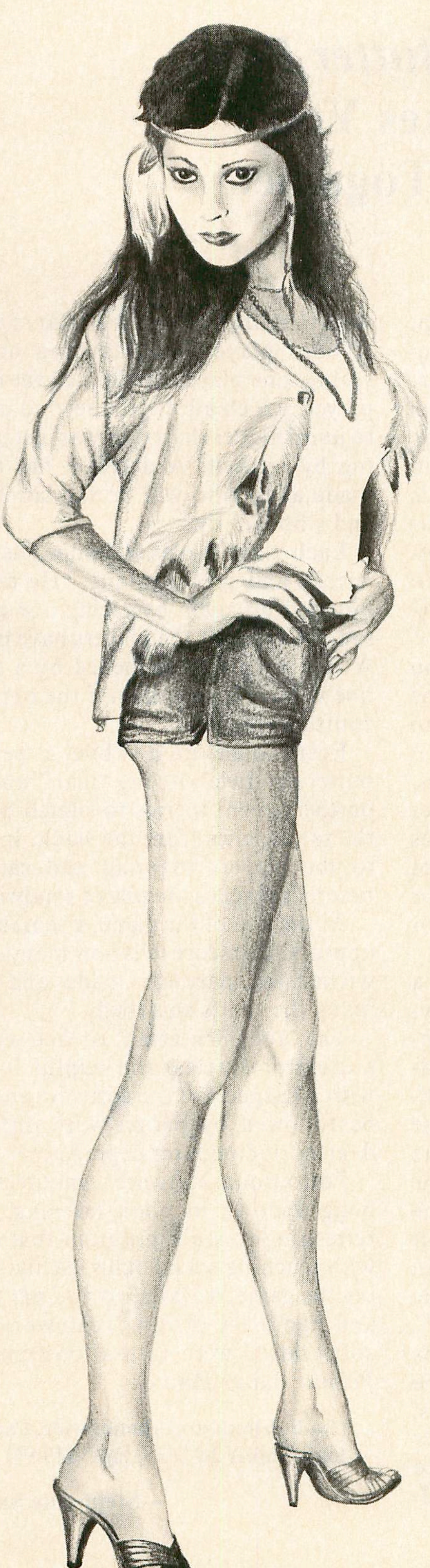

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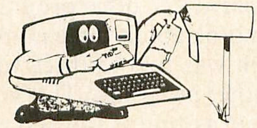

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Peanut Butter Panic Makes You Stick Together

Children's Television Workshop, creators of Sesame Street and The Electric Company, has expanded its horizons now to include computer software. The Children's Computer Workshop has developed games for children in three age groups. *Peanut Butter Panic* is one of several programs in the Cooperation and Strategy Series, which is written for seven-to 10-year-olds. A CoCo with Extended BASIC, as well as joysticks, is required.

After *CLOADing* the program, you type *RUN*. This continues to load the rest of the program. The time it took to load seemed rather long so I timed it and also compared it to other programs. This program took about three minutes to load, which was two to three times longer than other programs. This is not really a problem as long as you and your child are aware of having to wait for awhile before you can start the game.

The game itself is quick-paced. It is a two-player game and encourages players to work together toward the common goal of making peanut butter sandwiches. Sandwiches are made by catching stars and putting them into the sandwich making machine. The stars are of varying sizes and the bigger the star, the more energy it feeds into the machine. When enough energy is built up, a sandwich is formed and stacked in the middle of the machine, between the two players.

The cooperation and strategy aspects of the game come into play when the players try to catch the biggest stars, which are high on the screen. A player jumping by himself will not be able to reach them. At either end of the sandwich making machine is a "star spring." If both players are standing on the spring, one player can launch the other player, which allows the second player to jump higher than if he was just jumping by himself. A decision has to be made as to who will do the launching and who will fly.

Each time a player jumps, he uses energy and grows thinner. He can be fattened up again by eating one of the sandwiches that the players have made. A thinner player launched by a fatter one will fly higher than if the opposite course were taken.

Every once in a while a peanut-butter-sandwich-loving "snarf" appears on the screen. It tries to snatch one of the sandwiches from the stack. It is up to the players to jump and catch it before it reaches the pile of sandwiches.

At the end of the game, a scoreboard appears. The score tells how many sandwiches the partners made and how many the snarfs snatched.

The documentation is well-written and extremely clear and helpful. It deals with all aspects of the software and can be followed by people with differing degrees of computer experience.

Educational software sometimes gets bogged down in book learning. It is refreshing to see a program that deals with teaching social skills. While playing the game, we laughed and panicked and had a lot of fun. Teamwork and cooperation were natural outcomes of *Peanut Butter Panic.*

(Radio Shack stores nationwide, Catalog Number 26-2523, tape, $19.95)

—Stephanie Snyder

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This is the only 100% machine language completely high resolution golf game you will find for the color computer. Your golfer is an actual little person you move around on the screen with your joystick, and when you have lined his club up with the ball you hold down the fire button and he will take his backswing. The longer you let him wind up, the farther the ball goes, and when you release the button he swings and hits the ball. You can watch it go right down the middle of the fairway, avoiding all those nasty water holes, sand traps, and cactuses. (Actually, you may not ALWAYS make a perfect shot — after all, this is golf.) When you get on the green, the view zooms in close while you putt. If you like golf, you will like TEEEOFFF. For 1 to 4 players, 100% ML. You need a joystick. **Tape — $24.95; Disk — $29.95**

Colorkit

What can we say about the absolute best state-of-the-art programmer's utility. This program adds 35 commands to BASIC that should have been there all along and no short description will do it justice. Summary - light or dark screen, keyclick, screen editor, programmable keys, a super memory tool, variable listing, echo to printer, BREAK disable, convert machine language to DATA, global search, single step thru program run, double space printouts of program listings - that's less than half of what it will do. It takes about 6K of space, and if you have 64K you can put it up high and lose no BASIC space at all. 100% ML. Fully relocatable. See the great reviews in Nov. '83 issues of Hot Cocoa and Color Computer magazine. **Tape — $34.95, Disk — $39.95**

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Bomber Command Simulates History

In 1958, at the age of 12, I bought my first wargame. I still have it. Now, 25 years and many wargames later, I find that my interest in them has not waned. In fact, one of the reasons I bought my CoCo was the hope that I would eventually be able to play serious wargames on it. Thanks to Ark Royal Games I can do just that.

Bomber Command is a 16K wargame program for CoCo written by David Cochran and Phillip E. Keller. It is *not* an arcade game. It is a strategy wargame designed to simulate the elements of the airwar over Germany from 1941-1945. You control the Allied side and launch bombing missions from England against German industry and air defense elements, including anti-aircraft batteries and the Luftwaffe, on the continent.

Although the program is complex in design it is easy to learn how to play. The game is played in monthly turns. The player navigates his bomber force over a map of Europe controlling direction and altitude with the arrow keys. As targets are located they are attacked and bombed. Tactics must be developed through experience to minimize losses while accomplishing the mission.

Each month reinforcements are received and the player has the choice of launching a mission or moving on to the next month and receiving more reinforcements. Skipping a month will enlarge your bomber and fighter forces but it costs you time while allowing the enemy to build more anti-aircraft and Luftwaffe units. A specific mission target is assigned each month and destruction of these types of targets on the upcoming mission will result in extra points.

While each turn is in progress the screen display shows a section of the map (which scrolls very nicely as you move) and an information section which details items such as altitude, heading, bombers left, fighters left, bombs left and fighter escort status. You can also call up a strategic map which shows the entire operational area and your current location. This map really helps in navigating to Berlin and Munich; the bombing of these two cities results in extra points.

The effect of enemy aircraft and anti-aircraft vary with the altitude of your bomber formation. This calls for a strategy of remaining at a high altitude until specific targets are selected, then diving to a low altitude (where bombing is more effective) to release your bombs. I particularly like the sound effects in this one; as the bombs impact they begin to explode one by one. You can even see the impact pattern as it spreads across the map while you are pullng off the target after bombs away.

Victory conditions are not delineated, rather you simply try to maximize your point score over the course of the game which, from my experience so far, seems to last from two to four hours. Four difficulty levels are provided. Thus far I have stuck to the lowest difficulty and my highest score yet is 401.

Both maps are in the low resolution text screen but make use of limited graphics (the authors call it semi-graphics) and provide all necessary information as well as being geographically correct. Documentation is good. The instruction sheet tells you all you need to know to get started but it's left up to you to come up with the strategy that will bomb Germany into submission.

I'm a wargamer from way back so naturally I loved *Bomber Command,* it's great. If you buy it be prepared to use you mind more than your trigger finger.

(Ark Royal Games, P.O. Box 14806, Jacksonville, FL 32238, cassette, $19.95)

—David Johnson

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Flash Cards—Good Learning Tool For School And Job

Remember all those "all-nighters" back when you were going to school, of going without sleep the night before a big test, cramming a semester's worth of knowledge between your ears? What about that awful black coffee that came back to haunt you a couple of days later? And the distinctive taste of No-Doze? Do students still use that, I wonder?

As long as there are schools and tests, students will procrastinate. People will get nervous and hyper. But thanks to *Flash Cards*, a new program by Harmonycs of Salt Lake City, those cram sessions can now be at least a little better organized.

Utilizing repetition, *Flash Cards* reinforces those items of study that can best be learned by memorization. It is designed to help anyone from age six and up to memorize anything from math to medicine to mythology.

You have to imagine that you are writing your own flash cards when setting up your questions and answers. On the front side of the card, you are given two lines to ask a question or present a math problem. If you want to ask yourself a history question, such as who was President of the United States when this country entered World War II, you have two lines to enter the question (26 characters on the first line, 23 on the second line). You are then asked to put the correct answer (Franklin D. Roosevelt) on the "back" of the card. You can just as easily type 2 + 2 on the first two lines of the "front" and the answer, 4, on the "back" side.

Up to 32 questions or problems (a minimum of five is required) may be presented. That should be plenty for most people at one setting. Appropriate musical sounds accompany correct and wrong answers, and the student's score is displayed at the end of the program. Students also are given a second chance at the questions or problems they missed the first time through.

Flash Cards also offers the option of saving the various study programs to tape so you're ready to review the history lesson several times before the big test. It is written in BASIC and requires 16K Extended.

Although I have focused primarily on educational uses here, it is easy to imagine *Flash Cards* being valuable to people in work situations. For example, someone in media relations could prep his boss on the kinds of questions he or she would receive from the press about a problem and be prepared to answer them after a session with a program like this one. Someone in the military who had to face a review board while competing for higher rank could quiz himself on the kind of questions that would be asked. Attorneys could use it to prepare their clients before a trial.

Flash Cards is basically a very simple program, easy to use, and reasonably priced. It also is a good example of the kind of learning tools that CoCo users are expecting and needing for their computer and themselves.

(Harmonycs, P.O. Box 1573, Salt Lake City, UT 84110, $11.95 on tape)

—Charles Springer

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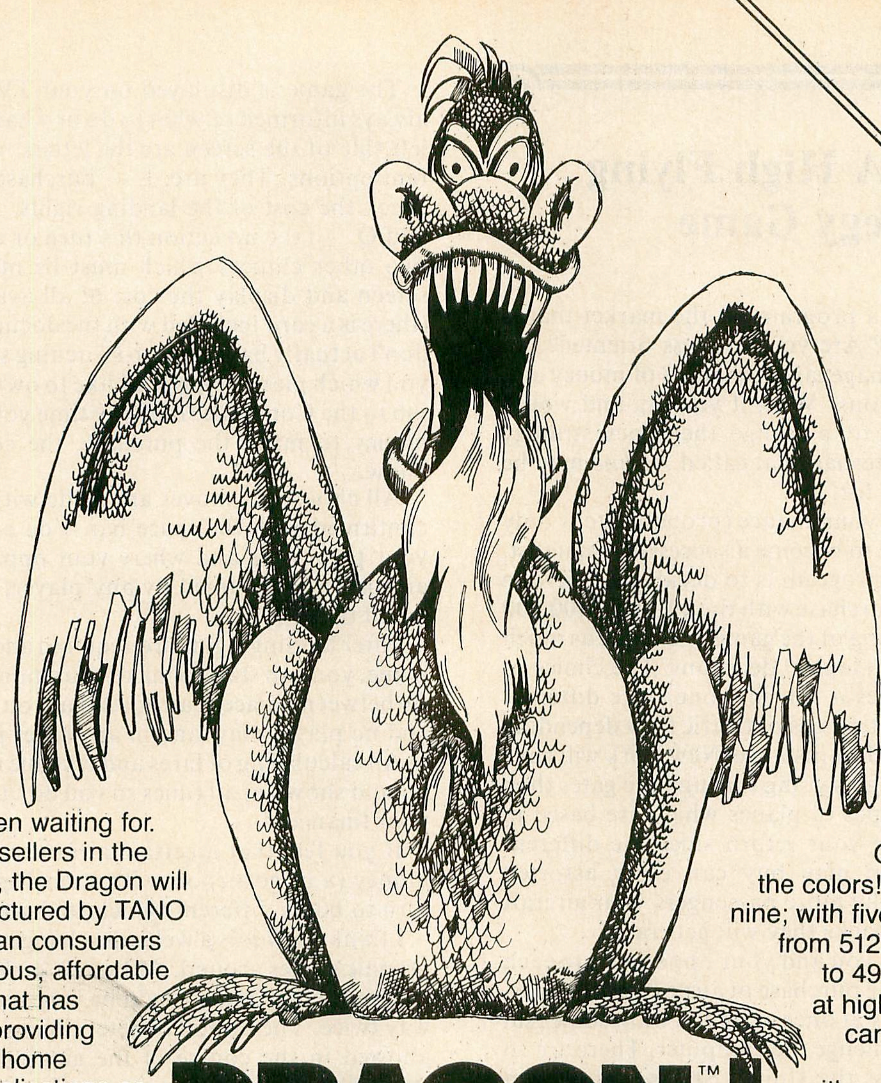

This, quite literally, is the color computer America has been waiting for. One of the best sellers in the United Kingdom, the Dragon will soon be manufactured by TANO to serve American consumers who want a serious, affordable computer; one that has proven itself at providing educational and home management applications as well as fun and games. To meet this challenge, the Dragon was born. With a standard 64K of RAM. A professional typewriter-style keyboard guaranteed for 20 million key operations. And an impressive array of options which include disk controller and drive, a printer, audio cassette recorder, a modem (RS-232 serial I/O), joysticks, game cartridges and a free BASIC training manual.

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Airline — A High Flying Strategy Game

Would you like to see a program on the market that is different from the others? Are you business oriented? Do you have the desire to manage large amounts of money and make fate-wielding decisions? Well, if you do, and would like to try a thinking game for a change, then a new strategy game from Adventure International called *Airline* may be just what you are looking for.

With *Airline*, you have your chance (probably your only one) to make millions and to become a successful capitalist.

The theme behind this program is to decide on where to base the planes that you purchase with the allotted $100,000 given to you at the beginning of the game and make as much money as you can through logical decisions. The choice of where to place your planes is a trying one since different airports will have different ranges of traffic flow depending on where they are located. For instance, New York will have a larger number of passengers going through the gates than Des Moines. Also, the types of planes which are based in your cities will determine your return since the different types of planes that you may buy can carry assorted amounts of passengers. The more passengers your aircraft can hold, the more greenbacks they will generate.

When the game begins, you and your opponent are each given money to invest in the purchase of airports and planes. Up to four people may play at once or, if you want some real competition, you may challenge the computer. There are 36 major cities located across the United States that carry a "price tag." By price tag, I mean that you must first purchase the "landing rights" before you are even allowed to land or base your aircraft in a city. The larger the purchase price, the more revenue it can generate.

Then, you must buy aircraft to transport your passengers from city to city to collect your fares, from which money you can buy more landing rights and more planes and so on. I think you're getting the hang of it now. Yes, the larger the plane the higher the purchase price, but the more fare revenues to be collected. Whew!

The game is displayed on your TV screen, and you are always informed of what to do or what is happening. On the left side of the screen are the letters representing your current options. They are: L — purchase landing rights, C — check the cost of the landing rights, P — purchase planes and Q — take no action this turn or quit. C and P present two other choices which must be made. C will clear the screen and display the cost of all available cities' airports (there is a card included with the documentation so that you don't actually have to keep switching screens) and P will ask you which plane you would like to own ranging from a prop job to the Concorde. If at any time you do not have enough money to make the purchase, the computer will let you know.

All choices or moves are made with the arrow keys and confirmed with the space bar. You can visually see where your planes are and where your opponent's reside, which airports are occupied by any player, and what planes are based there.

After landing rights are acquired and you own at least one plane, you can start to make your money. Also, planes must fly between adjacent airports that you own and not beyond, and no player may land in any other player's "airspace."

All calculating of fares and revenue is done by the computer and shown at all times so you don't have to keep track of your finances.

If you feel that a certain airport could be making more money (a large airport with a small plane) you can take a turn to buy a different vehicle and scrap the old one.

I think *Airline* is a welcome change from the usual fare of graphic games around. Although *Airline* starts off the same every time, the odds would be very high to play it the same way twice. The option of determining how many moves are allowed in the course of the game provides for different strategies. So, for those of you who are afraid of flying and would like the opportunity to toss around some big bucks, here's your chance. Remember, you won't come across any hijackers here—and best of all, you can forget about the airsickness bag!

(Adventure International, Box 3435, Longwood FL 32750, $24.95 tape)

—Steven Schechter

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Learning, fun and computer programs all mix together in *Jail* from Mr. R's Software. It is a well-written and documented educational program aiding in teaching spelling. You control the degree of difficulty by being able to create as many of your own data files as you desire. Teachers can create lists for each grade level. Parents can create lists of increasing difficulty as children progress. The children can make data files to interact with their parents.

In *Jail,* the object is to determine the word selected by the computer. You are given the number of letters in the word by blank spaces. Begin the game by selecting a letter. If the selected letter appears in the word, the computer displays it in the proper sequence, and you are given the opportunity to guess the word. If your selected letter was incorrect the phrase OFF TO JAIL is spelled one letter at a time. Each selected letter appears on the screen allowing the player to keep track of his selections. The game is for one or two players.

Also on the tape you may play *Scrambled Eggs,* a game for one or two players in which you unscramble a series of letters. Again the *Wordlist* program allows for creating as many of your own data files as you wish. If the players have difficulty in unscrambling, helpful hints are provided.

Both programs are fun ways in which to increase your spelling proficiency.

(Mr. R's Software, 68 Kelly Road, South Windsor, CT 06074, $16.95)

—Pamela Peitsch

Submitting Material To the Rainbow

Contributions to *the RAINBOW* are welcome from everyone. We like to run a variety of programs which will be useful/ helpful/ fun for other CoCo owners.

Program submissions must be on tape or disk and it is best to make several saves, at least one of them in ASCII format. We're sorry, but we do not have time to key in programs. All programs should be supported by some editorial commentary, explaining how the program works. We're much more interested in how your submission works and runs than how you developed it. Programs should be learning experiences.

We do pay for submissions, based on a number of criteria. Those wishing remuneration should *so state* when making submissions.

For the benefit of those who wish more detailed information on making submissions, please send a SASE to: Submissions Editor, *the RAINBOW,* P.O. Box 209, Prospect, KY 40059. We will send you some more comprehensive guidelines.

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Software Review

Isle of Fortune Is A Real Treasure

Isle of Fortune is a text adventure that is a real advance on the quality of BASIC adventures. This adventure has the same goal that about 80 percent of all adventures have. The goal is very simple to find the treasure and bring it back to where you started, in this case a waterfront bar.

The instruction sheet that comes with the cassette is complete enough to answer most of your questions but, is really not that necessary. The only thing that you have to read in the instructions is how to load the program, more on that later. When you first run the program, after a few seconds, it asks you if you would like instructions. If you answer yes, it shows you almost the same things that the instruction sheet does. One of the best things the program tells you, that the instruction sheet doesn't, is a list of all the verbs it knows. This is a great help! How many of you adventurers out there, like myself, have spent hours, days, or even weeks trying to figure out what that special word or phrase was that you had to use to solve the adventure? It also shows its list of verbs whenever you use one it doesn't know. So, it's helpful to give it an unknown verb just to review the verb list.

One of the features that makes *Isle of Fortune* a step above almost every adventure game I have seen is that it goes to great detail to describe or give a description of everything. I'm sure everyone gets tired of looking at objects and getting the same response of "I see nothing interesting." The descriptions do change as things are done to them. When you break or shoot something, it tells you it has been shot or broken.

A small annoyance that disk users have to endure, is that the program will not run with the disk cartridge in. To load and run this adventure, you must remove the disk cartridge (because it needs the extra 2K that the disk cartridge uses). This is one program that needs a full 32K computer to run. The repeated removal and insertion of the disk cartridge could cause some problems, so I suggest that you unplug the disk cartridge and leave it unplugged for awhile.

As a veteran of many text and graphic adventures, I am going to agree with the instruction sheet in saying this is a very difficult adventure and you must look at things very closely if you want to solve it. One aspect that makes this adventure harder than most is that when you start, it doesn't tell you which direction you can go, only what you can see around yourself. You have to find the compass to know which directions you can go. If you can't find the compass, you will just stumble around trying different directions randomly, as I did when I first played.

Isle of Fortune does have a couple of sports that can stump a beginning adventure for a while, because in a couple of locations, the regular directions N(orth), S(outh), E(ast), W(est), U(p), and D(own) wouldn't get you to the next location. In these locations you have to give it two precise words to get to the next location.

Overall, this has to be one of the best BASIC adventures ever written for the Color Computer. It does have a lot of interesting "rooms" spanning oceans, beaches, villages, jungles, and caves. The objects are so varied and interesting that they keep you constantly looking for new and different ways to use them.

(PAL Creations, 10456 Amanth Avenue, San Diego, CA 92126, tape $19.95)

—Jeffrey Loeliger

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Cooling Your Hot CoCo With The Dragonfly Fan

Because the Color Computer, like most microcomputers, has a nasty habit of getting hot, a number of cooling fans have been introduced to solve the problem. Some mount inside the CoCo, while others hang on the side of the unit. Almost all are rather large and many are noisy. A new fan that I received for review, the Dragonfly Fan, is very different from any that I had seen. It is small enough to mount inside the CoCo without any internal changes, draws almost no power, and makes very little noise.

The Dragonfly Fan is based on a quadrature fan module made by Piezo Electric Products of Metuchen, N.J. Instead of an electromagnetic motor as used in other fans, the quadrature fan is powered electrostatically. It has two plastic blades that are moved side to side by a pair of piezoceramic bending elements. The fan is approximately 3¼" long, 2" wide and 1⅛" thick. It moves five cubic feet of air a minute yet draws only .11 watts (not 11 or 1.1, but .11!) from the 120 volt power line.

As supplied, the fan has a six-foot power cord and two pieces of foam tape. The instructions tell you to peel off the backing strips and attach the fan to the inside of the case top, near the cartridge flap, so that the mouth of the fan is pointed toward the vent slots. You then cut out a small notch next to the power switch so that the cord will come out next to the power button. I brought the cord out through the channel switch hole instead; this method doesn't require any cutting. You could also cut off all but a foot or so of the cord and solder the leads directly to the CoCo's power cord just before it plugs into the transformer.

One interesting sidelight on the subject is that a number of factors affect the heat generated by the chips inside and, thus, your need for a cooler. Integrated circuits vary greatly from part to part of the same type. One 6809E might work well at .89 MHz but crash at 1.78 (high speed on a CoCo), while the next part off the line works at 3.58 MHz even though it's only rated for 1 MHz. The reason that a chip gets hot even though it's not handling more than a few microamps of current is because of the fast switching that goes on inside the part. That notoriously warm SAM chip handles an incredibly large amount of switching in its job of routing signals among the CPU, VDG, ROM, RAM and port chips. *POKEing* 65495,0 to switch into high speed causes all that switching to occur twice as fast most of the time, and even more heat is generated. (That old hackers' tale about burning up a SAM by *POKEing* high speed, while an exaggeration, has a good deal of truth to it.) The higher the maximum speed of a given chip, the lower its operating temperature will be at a given speed; as an example, that slow 6809E that I mentioned will run hotter at normal speed than the fast part that came after it. If one chip in your machine (other than the SAM) is a great deal warmer than the others you may want to replace it with a faster part (for example, a 1MHz 6809E can be replaced by a 2MHz 68A09E). This rule also applies to RAMs, with the added note that 64K RAMs generally run cooler than 16K parts, since 64K are usually made to run at 150 ns as opposed to the 200-250 ns average of present 16Ks. This might be an excuse to upgrade to 64K.

After all is said and done, the real question is: Does the Dragonfly Fan actually help keep the CoCo cool? As it turns out, I was unable to tell if the CoCo was cooler with the Dragonfly Fan than without it. The particular CoCo that I used for testing runs cooler than most, and I never felt any excessive amount of heat on the chips either before or after installing the fan. I can tell you that the Dragonfly Fan moves a substantial volume of air through the CoCo, so it should help if the computer is overly warm. (The fan is suitable for installation in the standard models of the Color Computer, including the new 64K Color Computer, which have the vent slots on the left and right sides of the unit; I don't think it would work well with the TDP-100 or the new Color Computer 2, because of the top located slots.

The Dragonfly Fan is an attractive way to cool off the CoCo; it's certainly neater than an external fan, and it can be installed and then forgotten (but remember to plug it in). If your Color Computer does get hot, I wouldn't hesitate to try it.

(Dragonfly Software, 12503 Davan, Colesville, MD 20904, $18)

—Ed Ellers

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Prepare For Tough Battle With *Glaxxons*

Glaxxons is a new machine language arcade-type game from Mark Data Products. I would call this game a cross between *Galaxion* and *Centipede*. Upon typing *CLOADM*, the game will automatically execute. After the title page has appeared, the computer asks for the game speed. A number between 1 (slowest) and 7 (fastest) will be sufficient. Next, the computer requests the level at which player 1 would like to start. Again a number between 1 (easiest) and 7 (hardest) should be entered. If another player would like to compete, he/she must enter their starting level, otherwise pressing [ENTER] will start the game.

The game begins with the words "Prepare For Battle" written across the screen. Your ship rises from the bottom of the screen with a high to low beeping noise. Then the words disappear and the action begins. About 20 alien ships start to appear from the top of the screen and take their place in the formation. Now is the time to shoot down as many aliens as possible because they will soon swoop down at your ship littering the universe with an array of missiles. You start with three ships and each ship can be hit three times before the shield power has been exhausted. If you are fortunate enough to defeat the squadron of aliens, a new batch in a new formation will appear destined to annihilate your fleet of ships. But if you're like me and you lose a ship before shooting down the squadron, a brand new squadron will swoop in to fend off the attack of your new ship. Once you lose all three ships, the words "Encounter Over" will appear and the game is over.

I've played many CoCo games but this game definitely ranks as one of the toughest. Here are a few reasons why I make this claim.

- Your ship moves very slowly when compared to the aliens.
- Only one shot at a time may be fired by your ship while the enemies can fire a barrage of missiles.
- The enemy ships can move further to the left and right and can swoop back at you once they fly past your ship.
- The top row of spacecraft shoot guided missiles at your ship which are difficult to avoid.

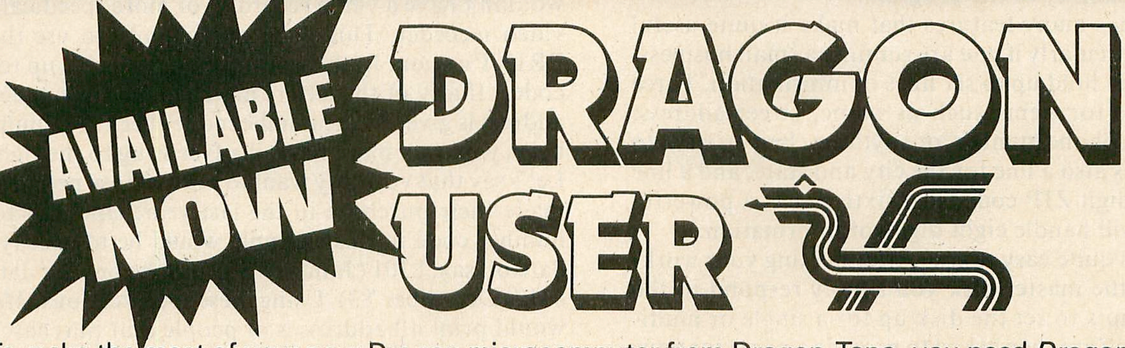
These and many other factors make this game very difficult, maybe too difficult.

Besides the great challenge, this game has many extra features. The four different types of aliens are well animated and highly detailed. Hitting the [BREAK] key will pause the game. Pressing the [BREAK] key while entering the game speed will cause the game to be locked into the demonstration mode that can only be interrupted by hitting [RESET] or turning off the computer. All these features are sure signs of a truly professional program.

Glaxxons runs in 16K and is very bug-free. Although *Galaxions* is an old game, the Centipede movement of your ship adds a unique feature. I would recommend this game to people who like *Galaxion* or want to play a truly tough game.

(Mark Data Products, 24001 Alicia Pkwy., No. 207, Mission Viejo, CA 92691, tape $24.95, disc $29.95)

—Ken Coleman



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Mailing List Program Is No Fly-By-Night

When *Mastermail* first arrived in the mail I was disappointed. I really wasn't all that excited about reviewing a mailing list program. I didn't think you could do much for this type of program to make it interesting. Well, I was wrong. After spending 10 or 15 minutes browsing through the instruction manual my adrenalin started flowing because this is more than just another mailing list program. It is a program that not only has potential for the home computerist but for serious business applications as well.

Mastermail is a disk-based mailing list program designed for small businesses or anyone that needs a program capable of handling 1000 addresses on a single disk. To use *Mastermail* you need a 32K disk system. If you have a second drive then each data disk can hold 1200 addresses. This program has a lot of bells and whistles that make it quite useful for the user that has need of manipulating large numbers of mailing addresses.

An 11-page instruction manual in a three-ring binder comes with *Mastermail.* The instructions are written quite well. There were only a couple of sections I had to read more than once to understand. The author uses the left-hand side of each 8½" x 11" sheet for written instructions. On the right-hand portion of the sheet he illustrates what the various screen displays look like that the instructions are describing. There are several misspellings and at least one error in the instructions. They are, however, quite obvious and do not affect the usability of the program.

Mastermail has many features that make it quite useful for the user, particularly if you are running a small business. Each address can hold up to six lines of information. Three of the lines are for items such as name, street address, company name, phone number, or anything else you want to include. There is also a line for the city and state, and a line for up to a 10-digit ZIP code. The sixth line is a powerful code line that will handle eight digits of information.

Mastermail is quite easy to use. After making your working copy from the master disk you simply respond to the on-screen prompts to set the disk up for a single or multi-drive system. You are then asked to provide a name for your data file. After formatting the disk for your file a menu is displayed giving several options: ADD ADDRESSES, DELETE ADDRESSES, EDIT ADDRESSES, FORM LETTER, PRINT ROUTINES, and SORT ROUTINES. The Add, Delete and Edit Address options are similar to many other database type programs. I'll not go into detail about them but they are straightforward and very easy to use. One piece of information that you can enter for each address is a code. This is very powerful and has unlimited application. I'll discuss it in more detail later. By the way, *Mastermail* holds very little data in memory. If you hit the [BREAK] key, or the program crashes for some reason, you will only lose one address.

FORM LETTER is a separate program that comes with *Mastermail* which allows you to produce multiple letters addressed to the people you have selected from the address database. The way it works is you must first create the body of the letter with a word processing program and then save the file to disk in ASCII format. You then load the file in using FORM LETTER and take advantage of some excellent features the author has added. For instance, the program will default to the first line of each address for the opening of each letter, but if you want, you can create a different opening.

Another option is to change the closing of the letter. The default is "Sincerely, . . . " plus the first and second line of your return address, but again you have the flexibility of using a different closing. There are several other options the FORM LETTER program has that allows you to tailor the letter to your specifications. I used the FORM LETTER routine with a letter I had saved using *Telewriter-64* and it worked just fine. One problem I did notice, though, was that the heading (name and address to whom the letter was written) didn't line up on the left margin where I normally put them. It is something that would be easy to adjust, though, since the program is written in BASIC.

The PRINT ROUTINES are used to print labels that are printed across (up to 11), the number of vertical spaces between labels, which lines of the labels you want printed, etc. Once you have entered a format you like you can save it for future use.

Now for what I feel is one of the best features of this program; the code attached to each address. The first input for every address is the code. Here you enter up to four letter codes plus four number codes. Here is one example of how the coding system could work. Let's say you own an appliance store and one of your customers purchased a VHS video recorder. His code may look like this: RV 8309. The R stands for video recorder. The V for VHS. The 8309 stands for September 1983 (the date purchased).

In December you decide to have a special sale on VHS recording tapes. You could send a notice to all your customers, but you would be wasting money since a lot of them wouldn't have a video recorder, or more specifically a VHS video recorder. This is an opportunity to use the CODE PRINT option. In this routine you can enter up to 17 letter codes. If any of the letters match an address code then the address is given to the number code check. The number code helps you even more to mail advertising to the right people. Let's say that you only want to notify those people that have made their purchase in the last year. One way to use the number code in this example would be to specify a cutoff date of, say, 8301 (January '83) and the present date of, say, 8312 (December '83). Using these specifications, *Mastermail* would print all addresses of people that purchased a VHS video recorder from you between January and December of 1983. You could then use the FORM LETTER routine to send a flyer or even a personalized letter to each customer of this select group.

There are numerous other features available with this program but I'll not cover them in this review. The most recent copy of the program I received does all the things it is advertised to do but there are numerous spelling errors on the screen displays and some other minor problems with the program. The author is working on these problems so by the time you read this review, corrections should be made. I feel this is an excellent piece of software and would recommend it to anyone needing a system with the kind of features I've described.

(Spectrum Projects, 93-15 86th Drive, Woodhaven NY 11421, $49.95 plus $3 SH.)

—Michael K. Hunt

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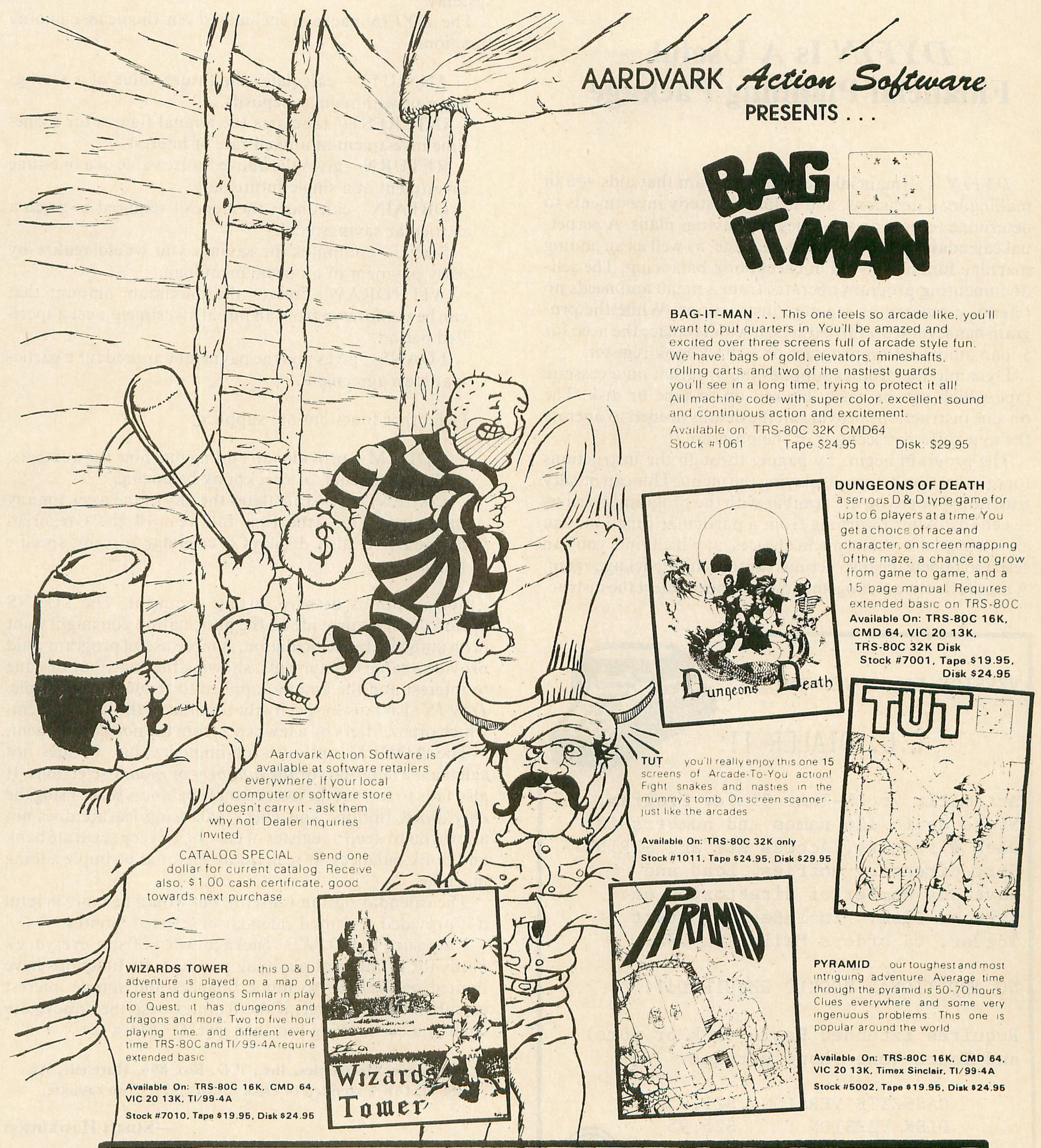

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DYFIN Is A Useful Financial Planning Package

DYFIN is a financial planning program that aids you in making loan decisions, and helps you study investments to determine returns on annuities and savings plans. A perpetual calendar is included in the package, as well as an adding machine function to aid in checkbook balancing. The self-documenting program operates from a menu and needs no reference manual or separate instructions. While the program has several useful features, it won't replace the need for a loan amortization program or a checkbook register.

Dynamic Electronics supplies the program on a cassette tape which can be easily backed up to tape or disk. The on-line instructions provide all the details needed to operate the nine different sections of the program.

The program begins by paging through the instructions for each section before displaying the menu. This can be very frustrating once you are familiar with the program's various selections. After returning from a particular function, you are presented with the menu choices, at which time you can select to review the instructions for the whole package again. A more effective arrangement would be to select the instructions for each function from the menu. This would be similar to the *help* function usually supplied with self-documenting systems.

The *DYFIN* package includes seven financial planning functions:

ANNUITY—calculates the future value of a savings account with regular deposits.

INTEREST—tabulates the annual figures for a one-time investment at a fixed rate of interest.

RETURN—gives the above future value of a one-time investment at a single future date.

OBTAIN—calculates the deposit required to reach a particular savings goal.

SAVE—computes the savings you would realize by early payment of an installment loan.

WITHDRAW—figures the maximum amount that can be withdrawn from an initial investment over a specified period.

LOANS—gives you the payment required for a particular loan agreement.

Two other functions are supplied:

ADDEM—provides an adding machine for numbers, dollars and cents, or checkbook balancing.

CALENDAR—calculates the day of the week for any date since 1753 (the first full year of the Gregorian calendar). It also displays a calendar for any specific month.

Some options deserve further comment. The LOANS option does not provide all the information you might want in an amortization calculation. A more useful program wuld provide a table of payments, showing the contributions due to interest and the amount applied to reduce the principle. *DYFIN* also fails to specify the amount of the last payment, which often differs by a few cents from the normal payment.

The ADDEM option is of limited value. It does not calculate a subtotal for the *numbers* or *money* selections. It also fails to format the intermediate balances while using the *checkbook* option. This check balancing feature does not allow you to keep a register of checks, or keep separate bank and book balances. It really only serves as a simple adding machine.

The calendar option is useful, but would be more helpful if it provided a printed calendar of selected months.

I am sure the *DYFIN* package will not suit everyone's needs for a financial planning package. Its functions have limited application to home finances and simple interest calculations. However, if the features described above are what you are looking for, then give *DYFIN* a try.

(Dynamic Electronics, Inc., P.O. Box 896, Hartselle, AL 35640, 16K Extended or Disk BASIC, $19.95 on cassette)

—Stuart Hawkinson

Hint . . .

Have you ever wanted to devise a simple "odds/even" or "heads/tails" utility program? If so, this might help:

```
10 RND(2)-1              (YIELDS 0 OR  1)
20 RND(2)>1              (YIELDS 0 OR -1)
30 ((RND(2)>1)*2+1       (YIELDS 1 OR -1)
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Doctor's Tableside Manner Unfriendly

Many times we need to look at disk data files to see what is stored there. A quick printer listing may be needed. Sometimes it's useful to edit those files without calling up the special program that created them. Once in a while a file may be unreadable, due to a missing end-of-file mark. Most sophisticated disk operating systems provide utilities to list and edit files, but not so with the Color Computer DOS. The *Data Doctor* is designed to overcome these limitations and provide an essential disk file editing capability. However, it's not a friendly text editor like most word processors.

Superior Graphic Software has produced a file editor with a number of useful features. It will build files, edit, or delete existing lines, and list or print the files. The *Data Doctor* will also allow you to retrieve files which are not normally readable due to missing end-of-file errors. The program has a number of editing features including insert, delete, retype, and change words in a line. Edited files can be saved back to the disk.

The *Data Doctor* is written in BASIC and operates in a line-by-line mode. More powerful editors like *Scripsit* operate in a full screen mode, in which you can select items by moving the cursor. A line-oriented editor like the *Data Doctor* only allows you to select a line number for editing. Any changes to the line are then made by first typing the words to be changed, followed by the new text.

The delete option allows you to delete a range of lines. You can also insert a number of lines after a specified line, or retype a complete line. All files to be edited or listed must be in ASCII. BASIC programs can be edited if they have been saved with the ASCII (,A) option.

Other commands include a selective listing of lines to the screen or printer and loading and saving files. The listing options do not include any formatting capability. Printed output will be the same as file format, except for an indentation of four spaces for each new line.

The program returns to the main menu after each operation, so you have to keep in mind the line numbers of your text. If you forget the next line to be edited, you must return to the listing mode and try a new range of lines. Some other line-oriented editors keep a display of previously selected lines on the screen. This makes it easier to reference the next line number for editing.

All the information needed to run the program is covered on a scant four pages. The instructions for recovering from a disk read error are easy to follow. The program will allow you to recover data up to the point of an error, although there is no mechanism for reading past the error. The instructions also describe how to alter the program to merge two or more ASCII data files.

During several hours of operating the program, I detected a few errors and design flaws. You can work around most of the problems, but some are really annoying. For example, after executing the *SAVE* command, the program returns to the *LIST* option. The program should return to the menu. (Line 72 needs a RETURN added.)

I encountered a problem with the delete command. It doesn't like line numbers greater than the last line in the file. If a range of line numbers ends with a number greater than that found in the file, the program deletes the number of lines specified in the range! For example, perhaps your file ends with Line 55. If you try to delete 41 to 60, the program deletes the last 20 lines, 36 to 55. (I would expect Lines 41 to 55 to be deleted.) Most line-oriented editors would delete from the first line in the range to the end of the file.

The *LIST* command doesn't like out of range line numbers, either. Specifying an out of range line will result in a fast scroll through the text with an immediate return to the menu. The message about how to stop scrolling usually scrolls right off the screen. A much better strategy would include a slow scroll option, and/or relative line references. It would be easier to say "list the next 5 lines," rather than to give the absolute line number ranges each time.

You can get confusing results after a few deletes or inserts near the beginning of the text. Sometimes a file will have Line 0, other times Line 0 will be blank. Once you have a Line 0, you are stuck with it. However, you never know if it's there without listing from zero.

The *Data Doctor* does allow you to edit text files and recover from some particular problems. However, I prefer a more friendly editor. Many of the full-feature word processing programs will give you more capability for nearly the same price.

(Superior Graphic Software Products, P.O. Box 451, Canton, NC 28716, 32K disk, $49.95)

—Stuart Hawkinson

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Money Manager Is Creditworthy

How many ways of keeping track of your money have *you* used in your lifetime? If only there were a perfect system —one that lets you spend as much as you want without going broke and keeps perfect records without any help! Ah, well — perhaps you revert like we sometimes do to an envelope system: one for each account. If you don't have anything in the envelope, you can't spend it (or else you borrow from another envelope, and it begins all over again).

Money Manager won't rescue you from the results of deficit spending, but it can be useful in keeping track of just how far in debt you're going to be. Its approach is similar to using the envelopes.

This menu-run program allows maintenance of up to 26 budget categories (including savings accounts), named any way you like up to eight characters each. If you want, *Money Manager* will alphabetize the accounts. You may add or subtract amounts from each category, noting where the money came from or where it is going, the date and the check number (if applicable). Make a mistake? You can replace or delete transactions.

If you have a regular paycheck with the same amount each pay period, you can take advantage of *Money Manager's* budgeting feature. First, determine the annual amount you expect to spend for each category and divide by the annual number of paychecks. The program then will automatically credit each account with the amount decided upon each time you inform CoCo that you have received a paycheck. (NOTE: Lying to your computer won't help your bank account unless you have access to *their* computer.)

The budgeting feature will be of little, if any, use if you have an irregular paycheck; ie, it will not proportionately divide irregular income or unexpected bonus checks. Those must be divided and credited individually to each category. If you have more money than needed to pay your bills (some programmers are optimists), you will need to create a "Miscellaneous" category into which to put it. If you have less (join the crowd), the deficit will be shown.

If you use your checkbook to record *all* your income and expenditures, you can use *Money Manager* to verify your checkbook balance. However, this should not be confused with a full checkbook balancing subroutine.

After an initial *PCLEAR 1*, a 32K system can handle only 300 transactions with this program, which means starting over when you reach the limit. *Money Manager's* approach to this problem is to allow periodic condensing of the accounts. For instance, if you have 25 accounts with 299 transactions and condense them, you then will have only 25 cumulative transactions with their current balances. Data may be saved (tape or disk) and a hard copy printed before condensing (and after) so that you have a record of all transactions to that point.

Its author calls it user-proof, but then he doesn't know me! Take my word for it — selecting the *PRINT* option without having the printer on will cause the progam to hang up, requiring you to push the [RESET] button (and consequently losing data upon return to the program). This could be avoided either with a simple *PEEK* routine in the program or else by paying attention to what you're doing.

Documentation is good but could be improved with sample entries carried through each routine.

In deciding what budget program to purchase, it helps to know how its features fit your style of budgeting. Some people want to keep it simple; some want or need all kinds of extra help. My ideal includes setting up a budget based on a biweekly paycheck; having a monthly summary; letting the computer do the set-up calculations and proportionately divide income of any amount among the categories without having to input each one separately; carrying a "cash" category that doesn't require me to use a check for everything; having a real checkbook balancing routine; and the ability to call from memory any month's expenses, perhaps with a yearly summary — all for a SASE.

Money Manager is fairly straightforward, can help you keep track of every penny and carries a moderate price tag. So check the features, compare prices — and debit your account.

(Reitz Electronics, 3170 W. Central Avenue, Westgate Meadows Shopping Center, Toledo, OH 43606, 32K ECB cassette, $24.95)

—Warren S. Napier

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Balloon Attack—A Game . . . But A Better Learning Tool

Balloon Attack is an arcade-type game that follows a theme similar to the invader-type games. In this one, a hot air balloon is flying overhead dropping objects on you. The goal of the game is to try and avoid as many falling objects as possible. Most importantly, the game can also be used as a teaching tool for people wanting to learn how to write games such as this using machine code.

The game comes with a 25-page manual that lists the machine code, and has comments for practically every line describing the programming techniques. For instance, all of the routines that draw a figure on the screen have been purposely written in varying ways. This was done to show some of the different methods in which a typical routine can be written. Thus, a major purpose of *Balloon Attack* is to provide a little help and guidance for budding software authors. The author states on Page 1 that the program will run on any TRS Color Computer.

As for the game itself, I was somewhat disappointed with *Balloon Attack*. It starts off with a hot air balloon rising to the top of the screen and then traveling back and forth dropping objects on your man on the bottom of the screen. You have no offensive weapons in this game. The strategy is to just avoid as many falling objects as you can until time runs out. You are awarded points for each object that you avoid and penalized for each object that hits you. When time runs out your final score is displayed and you can start again if you wish.

You do have the option of using a joystick or the right and left arrow keys. I found the arrow keys to be much more responsive than the joystick. In fact, I just plain didn't like the joystick response at all. I must admit, though, I do have the original joysticks that Radio Shack designed for CoCo, so this may be part of the problem. At any rate, I lost interest before time ran out the first time I played it.

For the price the game sells for, I certainly expected more action and challenge than it provides. The fact is, the balloon is randomly dropping objects so fast that even if you let your man sit still on the screen, you still score more points than you lose most of the time. In fact, I tried getting hit as often as possible several times when I played the game and only once did I manage to finish the game with zero points. If I tried to avoid the falling objects, I was normally able to score over 28,000 points rather easily. I would rate the graphics about average and the sound a little below average.

I have not dabbled in machine code, so I'm not sure how good the explanations are, but they look to be fairly comprehensive. You can see, step by step, exactly how the game was written and executed. I would say it looks as though the manual is written for someone with some experience in machine code, because there is no tutorial provided, just the source code with comments. But, with the disk version and the Micro Works assembler, you could even reassemble portions of *Balloon Attack*.

I was also disappointed in the instructions provided to get the game started. The first page tells you how to start the game, but you have to figure out how to get it loaded into your computer by yourself (and there are two BASIC files, one binary file, one data file and two text files!). By looking at the disk directory I was able to figure out how to do this, but there should be some instructions provided.

As you can tell, I am not overly impressed with the play of *Balloon Attack*, but I can see possibilities for someone wanting to learn how a game such as this is written. Primarily, it is more of a learning tool than a game.

(Computer Shack, 1691 Eason, Pontiac, MI 48054, $21.95 for tape, $23.95 for disk)

—Michael K. Hunt

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Two-Game Pak Demonstrates Artificial Intelligence

What we have here are a pair of new programs from Elite Software, something virtually for everybody: *Body Parts* (a.k.a. Bawdy Parts) for the adults and *Guess the Animal* for the youngsters.

The programs are constructed in much the same way, demonstrating the use of artificial intelligence in computers, the way they "learn" and simulate the human thought process.

When you first load them into CoCo, they are like naive children. As you play, the computer learns from your responses, becoming more intelligent with each new round.

If you need graphics to appreciate the programs you feed CoCo, forget it. These programs are for those who can appreciate CoCo's appetite to digest and assimilate logical connections.

Don't get the idea that these programs are not fun because of the abilities they demonstrate. *Body Parts* gets to be downright bawdy if you supply the "right" answers, and *Guess the Animal* is really silly at times.

In *Body Parts*, you are asked to think of a part of your body, which can be X-rated if you're so inclined. Just remember that the computer will learn exactly what you tell it.

Then you are asked for a clue using two- or three-word phrases. Simple clues that describe some attribute of the part are best, such as "It smells" or "They are wet."

You will answer one or more questions from the computer, telling the truth, of course. If you intentionally mislead CoCo, you will confuse the learning process.

When CoCo thinks it knows the part, it will take a guess. Early in the game, the guess will usually be wrong. At this stage, CoCo is expanding its knowledge base. You should type in the correct answer, answering a couple of more questions afterwards.

The program does not store the relationships in a tree form, according to author Bruce M. Cook. Rather it dynamically searches for the best clue available to narrow down the number of possible body parts. After a round, when the true body part is known, the knowledge base is adjusted to reflect the original clue that was given, as well the responses to all of the questions that were asked. This approach allows the program to quickly home-in on a guess and provides variety to the game to keep it fresh and interesting.

Guess the Animal works much the same. You are asked to pick an animal, give clues and answer questions about the subject. I submitted elephant, for example, and CoCo asked: "Does it eat flies?" and "Does it jump?" Obviously the animal already included in the program is a frog, so the questions are indeed ridiculous in the early stages.

The more information you give the computer the more intelligent it becomes (an understatement if I've ever written one). The only problem is that the programs' memories are erased after you get through playing and you've got to start all over again the next time, right? Wrong! Elite Software provides details on how you can save the existing stage of the program to tape, putting you way ahead the next time you're in the mood.

The programs also come with both 16K and 32K versions on each tape, the difference, of course, being the amount of data you can store. They also are written in machine language so the games do move along at a good pace.

(Elite Software, Box 11224, Pittsburgh, PA 15238, sold separately: $17.95 tape, $20.95 disk; sold together: $24.95 tape, $27.95 disk.)

— Charles Springer

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Tom Mix Flies Again With *Buzzard Bait*

Just minutes from my office there's a super video arcade that I pass by or through daily on my way to lunch. I visit the establishment often just to see if there's anything new, often wondering how soon this game or that one will be adapted for use with CoCo, sometimes believing that it would not be possible for some of the more sophisticated games.

Take *Joust*, for example. I have marveled at the game from afar, never able to get close enough to play it during the lunch hour because there are always people lined up in front of the machine. The game appears to be such a challenge that I know I would waste more than two dozen quarters trying to build up a level of competence. What a sight it is, those knight-mounted Ostriches flapping their wings and soaring about, squawking and chirping, and running with the speed of greyhounds when they land. Could such a sophisticated game be suitably adapted to CoCo? I must admit I had my doubts.

I did not have to wait long to get the answer I really wanted. Yes, said Tom Mix Software, we've done it again! And, indeed, they have done it again. *Buzzard Bait* convinces this writer that there is nothing that the many geniuses working with CoCo programs can't reproduce and improve upon. Save your money at the arcades, folks, because these games are a lot more fun at home!

I have sampled *Buzzard Bait's* endless challenges dozens of times since it auto-loaded on my monitor. If you're into games and you're still stuck at 16K, this probably will be the program that makes up your mind for you that you absolutely have to upgrade, at least to 32K, and while you're at it, you may as well go all the way to 64K.

The first time through, my eight-year-old son Stephen absolutely flew circles around me. There I was running frantically about, hopping up and down while his bird was flying about with the grace of an eagle. I quickly discovered that my young one had been spending the quarters I had been saving. I had no idea how to make my bird fly. "Keep pushing the firebutton, dad," he said. It took me a little while to get the message but I discovered that if I repeatedly and rapidly pushed the firebutton on my joystick that I, too, could soar about. "Hey, I'm flying," I cheered, upon taking off.

The game can be played by one or two players and the object is to proceed to higher levels of difficulty by destroying the enemy warriors — who also are mounted on capable Ostriches.

Okay, so I was flying. But every time I came into contact with an enemy warrior it seemed, my knight would disappear and my bird would go flapping off the screen. What gives, I wondered, as I kept fleeing those maniacs.

"Son, how do I kill them?" I pleaded. The answer was that my knight has to be positioned above an enemy in order to *eliminate* it. Sounds simple, but these folks seem to have a mind of their own. What confused matters was that when we got close to the edge of the screen, the action would switch wrap-around style to the other side.

When the enemy bird has been dismounted, the bird flies off the screen (which was distracting at first because it seemed so curious — those birds flapping their wings). However, the rider of the bird is transformed into an unhatched egg. Within seconds, the egg begins to expand and crack during a marvelous rebirth cycle. If a riderless bird comes into contact with the egg, the enemy gains new life. To stop this regeneration process, a player must capture (touch) the egg.

As the game progresses, certain land masses begin to crumble away. This not only gives you and your enemies more room to fly but it also allows for strategic maneuvering. In addition, it adds a distinct element of danger because, if you are careless, you are engulfed in pool of lava at the bottom of the screen.

There are as many levels of difficulty as you can master, each of them fraught with peril. Although you are in a competitive situation in the two-player mode, you can gain extra points for cooperating in trying to defeat your common enemy.

And than there's the deadly Pterodactyl (or the Buzzard, the game's namesake). He can strike at any time and you're almost powerless to defend against this menace. Your only hope is that you've mastered your Radio Shack joysticks to the point that you can lance its throat. The Pterodactyl occasionally brings friends along and since his appearance is unpredictable, you have to be alert, always.

If you panic at any time, you can always hit the "P" key on your keyboard and halt the action. If you're beyond hope, you can simply tap the "R" key to immediately begin a new game.

Excuse me, but I'm going to tap the "R" key now, and get back to this fascinating game.

(Tom Mix Software, 3424 College N.E., Grand Rapids, MI 49505, $27.95 tape, $30.95 disk)

—Charles Springer

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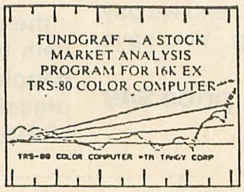
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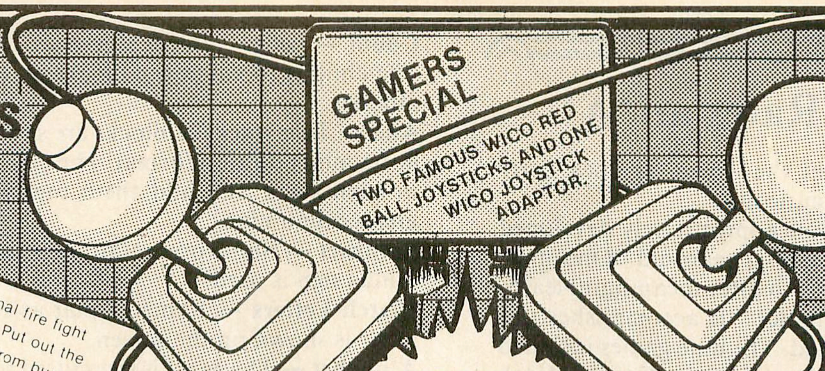

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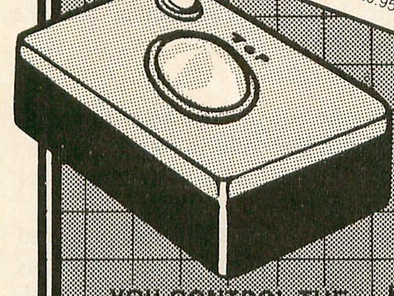

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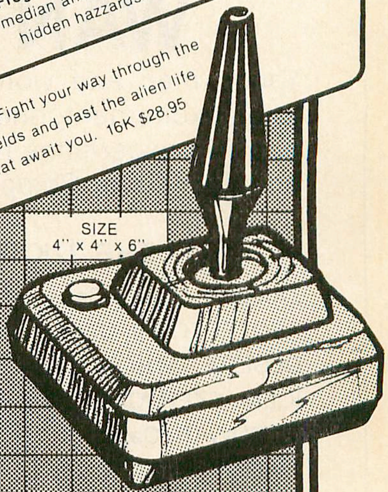

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Early Games Rates an 'A'

Just as the early bird caught the worm, so does *Early Games* snag the young child's curiosity.

Early Games is a series of nine appropriately developed activities for children aged three to six years old. "One of the primary goals of *Early Games* is to offer meaningful learning experiences for the preschooler." It accomplishes this goal in all the activities presented. The nine games included in the package are Alphabet, Match Letters, Count, Match Numbers, Add, Subtract, Names, Compare Shapes, and Draw.

A unique feature of this program is the menu and how the programs load from the menu. An example of each of the activities is flashed on the screen for a set amount of time. The sequence is continued until the [ENTER] key is pressed. The game that is being shown on the screen is loaded into the computer. Adult supervision is needed for this part of the program, but a child will soon be able to operate the program with a little assistance. When the child desires to play a new game the [BREAK] key is pressed and the menu is run again. The same procedures are followed for starting a new program. Here is a brief description of the nine activities in *Early Games.*

Match Numbers — A large number is displayed on the screen. The object is to match the number with the proper key.

Count — Large colorful blocks are displayed on the screen. The child is to count the blocks and press the appropriate number.

Add — Two stacks of blocks are shown on the screen in the horizontal addition format. The child is to count the blocks in each stack and add them together. The sum is never greater than nine.

Subtract — Same presentation as the addition game but a minus sign is used.

Match Letters — Same format as Match Numbers but a letter is shown on the screen.

Alphabet — The game is structured for learning the sequential order of the alphabet. A letter is displayed on the screen and the child is challenged to find the next letter. If the response is incorrect, the alphabet is displayed up to the letter being questioned. Another incorrect response and the letter is displayed in the correct position. When the response is correct, the letter is displayed and the computer proceeds to the next question.

Names — Adult supervision is needed for this segment of *Early Games.* The child may then practice typing her/his name with guidance from the computer.

Compare Shapes — Four different shapes are displayed on the screen each with a number. All shapes are the same color but one has a different shape. The shape must be identified and the correct number must be entered.

Draw — This element of *Early Games* allows very young children to have the power of drawing right at their fingertips. The position of the keys on the keyboard determines which direction the cursor will move. Upper keys draw up; lower keys draw down; corner keys draw diagonally. The space bar changes the color of the cursor and of the lines that are drawn after the change. Pictures may be saved to disk and retrieved at a later time. The drawing is done in a low resolution mode, which is fine for the targeted age group.

This program was extensively tested by a three-year-old and a five-year-old. THe five-year-old had little trouble after five minutes of instruction. The construction of the program still provided a valuable learning experience for the three-year-old.

Rainbow Report Card

Appropriateness — Right on the button. The activities presented have been developed with the child in mind.

Documentation — Provides the necessary information for program operation in a 10-page booklet form.

Ease of Use — Program operates without any problems and is structured for use with small children. [BREAK] key is configured for returning to the menu. The only way to crash the program is to shut off computer.

Meeting of Objectives — *Early Games* provides meaningful learning experiences for the young child. Meets program objectives on all counts.

Enhancements — Some variety in the reward for answering correctly would be a nice addition. Hearing the same tones for a half hour does get to your ears.

Grades	
Appropriateness	**A**
Documentation	**C**
Ease of Use	**A**
Meeting Objectives	**A**
Final Grade	**A-**

(Counter Point Software, Inc., Suite 140, Shelard Plaza North, Minneapolis, MN 55426,
16K Extended Disk BASIC, $29.95)

—Rick Cobello

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Color Micro Journal

The Color Computer Monthly Magazine

$1.95 per issue Vol. 1, Issue 2 October, 1983

THIS 'N THAT

The **BIG NEWS** this month is that OS-9 has finally arrived for the Color Computer. The **ASTOUNDING** part of the Radio Shack OS-9 Package, besides the price, is the **DOCUMENTATION**. You 'Old Time Radio Shack Followers' will not believe what you see. Jon Shirley has been telling us that the main reason for the "lack" of documentation with a lot of their products was the restrictions placed on releasing that information by **Microsoft**; I

OS-9 on the COLOR COMPUTER

One of the "Operating Systems of the Future" is **now available** for the "little old Color Computer"; **OS-9**. Freely translated, OS-9 means "Operating System for the 6809" (OS-9 is now being written for the **68000**, also). Since it is fairly obvious that UNIX and "UNIX-Type" Operating Systems will be running on just about every computer to come out in the next few years, a whole new language is beginning to appear on the horizon.

Color Computer OS-9; the Package

We had been running a preliminary release of OS-9 on the Color Computer for a few weeks, and received the "Official Radio Shack" version for Review a couple of days ago. To put it mildly, this package is **IMPRESSIVE!** For $69.95 (Radio Shack Catalog Number **26-3030**), you receive a 9 1/2" x 7 5/8" x 2" package containing 4

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Schematic Drafting Processor

Cosine, secant, tangent three-point-one-four-one-five-nine. Slide rule, T square . . .

I'll bet you've never heard that cheer before, or probably never want to again! Well, it's obsolete anyway. The slide rule, once hanging from the belts of engineering students, were replaced by pocket calculators and, more recently, by CoCos. Gone are the T squares, too. All replaced by CAD (Computer Aided Design) systems and the Schematic Drafting Processor.

In CoCo language you spell CAD "SDP." *SDP* the *Schematic Drafting Processor*, is a 480 x 540 pixel drafting board program written by Tony DiStefano and distributed by Spectrum Projects.

The object of the program is to draw, save and print electronic schematics. In recent issues of *the Rainbow*, you may have noticed that some of the schematic diagrams that accompany hardware articles have been computer generated. These drawings were produced using *SDP. SDP* requires a 64K CoCo and one disk drive. A Radio Shack, Gemini or Epson (with GRAFTRAX) printer is required for hard copy.

The 480 x 540 pixel drafting board is actually composed of six different screens, each available with a simple command from the keyboard. The well written manual claims the first *PCLEAR 24* graphics in existence. Not only can you draw over 30 common electronic symbols at the touch of a key, but you can define 10 of your own. A cursor is used to locate all symbols, and with the proper commands, also draws the connecting lines between them.

The first prompt of the program asks whether you want arrow or joystick control. In the joystick mode, the speed of the cursor is controllable. Not only can you draw diagrams, but you could have contests to see who can do them the fastest. Really, this is very handy, as long lines seem to take forever with the arrow keys.

There are several modes of operation, all well prompted, and pressing the [CLEAR] key in any mode will display a mini-help file. A quick summary of the modes is in order.

From a Main Command Mode, you can enter the Draw Mode, Angle Mode, Logic Gate Mode, Multipin Chip Mode, Erase Mode and Text Mode, to name a few. The modes are self-explanatory with the exception of the angle mode. Each symbol can be drawn in one of four different positions, each being 90 degrees apart. I hope you noticed the Text Mode. Your drawing can even have component numbers and values where they're supposed to be.

Since the width of the computer screen is not exactly double the width of the draft, there is an overlap between adjacent screens. This is very nice for joining lines between two screens. A sample schematic is included with the package for you to experiment with the different commands. It also helps point out the versatility of the program.

The 14-page tutorial is excellent. It explains each mode of operation and gives tables and examples of all symbols.

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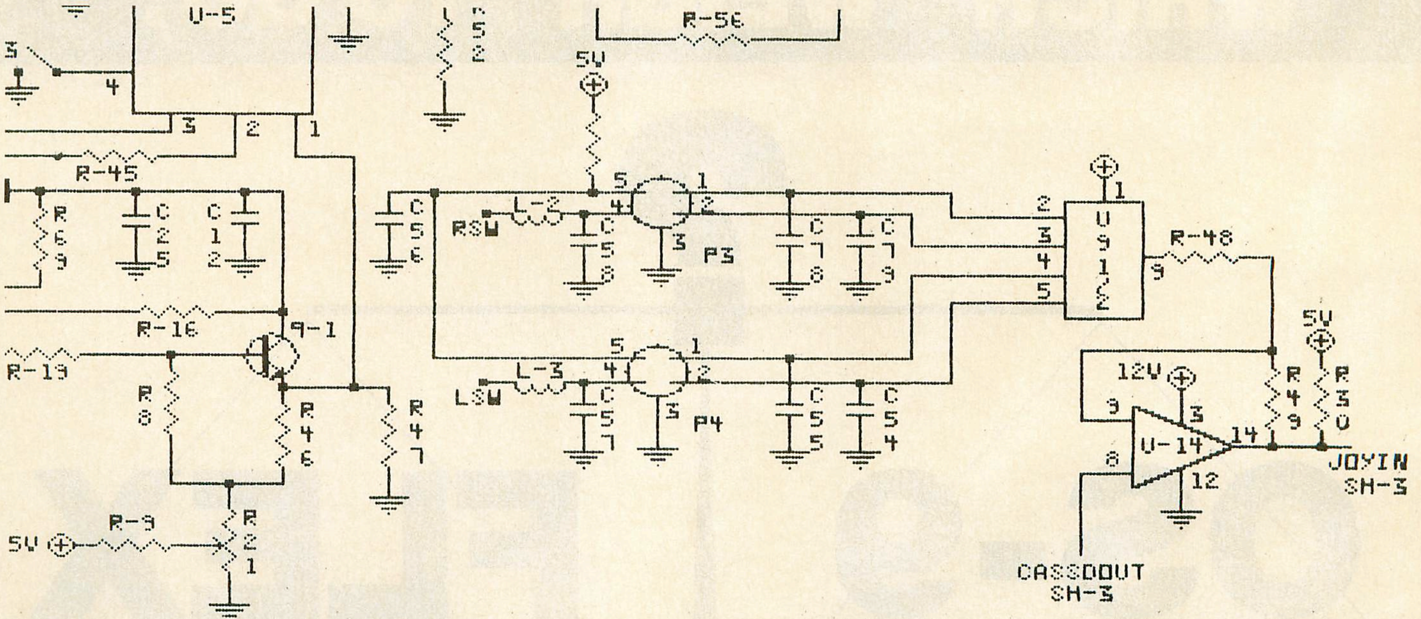
Sample schematic using *Schematic Drafting Processor*



There is also a short example showing how to generate your supplimental symbol table that can be saved and loaded from disk.

If you are hardware inclined, I think *SDP* will be well worth your investment. I don't think you will be able to take it to your drafting class, but it will pay for itself by eliminating the cost of erasers.

A word processor for drawings. Now, if it only could do automatic projection studies.

(Spectrum Projects, 93-15 86th Drive, Woodhaven, NY 11421, 64K disk, $49.95)

—Dan Downard

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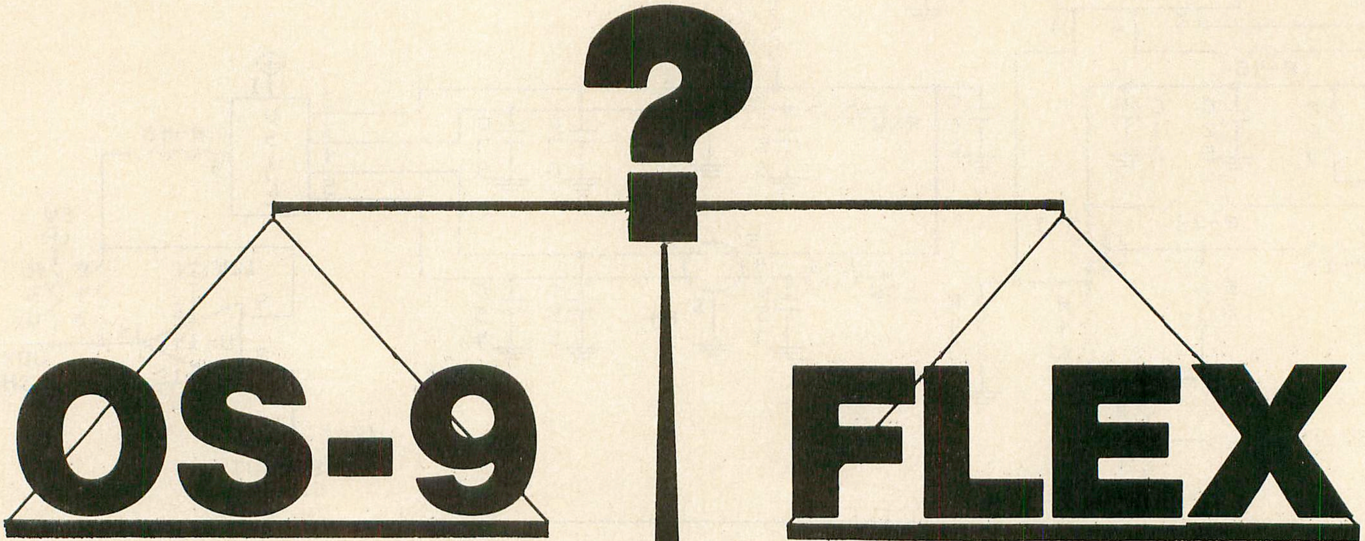

Taken from Microware's brochure, "OS-9 is a Unix-like multitasking, real-time operating system. Its modular structure makes OS-9 easily adaptable. OS-9 is widely used for applications in data processing, industrial automation, communication, instrumentation and education."

OS-9 FEATURES:

* Real-time multitasking executive.
* Hierarchial disk-file directories.
* Device independent, interrupt-driven I/O
* Modular software memory management
* Command interpreter with I/O redirection

Developed by Microware and Motorola about 3 years ago, OS9 has enjoyed a loyal following among users. There are several very good languages available for it. These include Basic09, Pascal, "C" and Cobol. Also, there are 2 exceptional Word Processors; DynaStar and Stylograph. To check spelling, Dynaspell and Stylograph's spelling checker are available. OS-9 is an excellent choice for control applications, and because of the demand for UNIX like operating systems it is an excellent choice for the CoCo. On the CoCo it offers type-ahead and a limited multi-user capability. Disk support is single-sided, double-density up to 40 tracks. Printer baud rates up to 4800 are supported. The operating system also provides graphics capability although the text screen, like that under RS DOS, is only 32 by 16. Memory is 42K of user RAM (33K with the use of a HiRes screen).

FHL has more software for OS-9 than everyone else combined! The perfect first choice is 'O-Pak', which adds a Hi-Resolution Screen and Copy utilities. Many other software packages require O-Pak to function. Some of the other OS9 software packages available from FHL are: SUPER SLEUTH Disassembler, CRASMB Cross Assembler, DYNAMITE+ Disassembler, A/BASIC Basic Compiler, and DO - A Job Control Language. Check our other ad for specifics or better yet, get our catalog. It's FREE!

FHL FLEX is the most popular "true" operating system for the CoCo. It has been available for 2 years and has more software available for it than any other Color Computer operating system. FLEX is easy to use and is known as being 'User Friendly.' The abundance of excellent software available makes it a good choice for the CoCo. FLEX has 46K of user RAM WITH a HiRes screen. This makes it possible to run complex business software like A/R, and spreadsheets like DynaCalc. FLEX supports 35, 40, or 80 track single or double-sided 5 1/4" drives. It even supports 3" drives! With FLEX you get:

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Optional DBASIC **$30.00** extra.

FINAL NOTE

Making the choice between two very good operating systems is undoubtably difficult. No other small computer has such a rich choice. The Color Computer user is extremely lucky to be able to choose from such offerings. So, the choice is hard. You could buy both and then decide, but that is costly. Many of the CoCo publications have been writing articles and columns about FLEX for 2 years, and similarly many will be writing about OS-9 too. It may take a while before a comparison can be made from them. The best way to decide for now is to determine what your software needs are and buy the operating system that supports them. We at FHL support BOTH operating systems. Call us for help concerning software availability or any other assistance you may require. Send for our FREE 32 page catalog and see our other ads.

***OS-9 is a registered trademark of Microware Inc. and also FLEX is a registered trademark of Technical Systems Consultants, Inc.**

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TSC XBASIC for CoCo FLEX: **$100.00**

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Command Stream Processor —A Powerful, Useful Utility

Have you ever had a complex sequence of commands to be performed on several files or wanted to run a long procedure without being tied to the keyboard? Then *Command Stream Processor* from Custom Software Engineering, Inc. could be for you.

CSP is a utility for executing user defined procedures. These procedures, or Command Stream programs,resemble BASIC programs in appearance but actually consist of a combination of direct commands, input data for programs being executed and Command Processor control commands.

A user creates a Command Stream program in the BASIC program area using all the standard CoCo tools (*LIST, EDIT, SAVE* etc.) then "attaches" it to *CSP* by making a call to one of the sequence of commands and data that would normally be entered at the CoCo keyboard were the program running interactively. A simple Command Stream program looks like this:

```
10 LOAD "SUM"
20 RUN
30 : 2, 3
40 RUN
50 : 10, 15
```

This procedure loads and makes multiple runs of a BASIC program called SUM which prompts for two numbers and displays their sums. Note that the line numbers are used for building the Command Stream program and that the colons in Lines 30 and 50 are used to separate the numeric data from the line numbers.

Once *CSP* is invoked, it takes over the keyboard line input RAM hook so that any "read" by the BASIC interpreter or a running program gets data from the Command Stream Program instead of the keyboard. When all the lines in the Command Stream program have been read, the RAM hook is restored so that subsequent reads go to the keyboard.

Two versions of *CSP's* position independent machine code are delivered on tape; a "short" version, which occupies only 140 bytes and a 450 byte "long" version which provides some additional functionality. The version to be used depends on the amount of available RAM and the user's particular application.

Two major features found in the long version, but not available in the short version, are error handling and Command Processor control commands. The error handler feature optionally causes *CSP* to abort processing of the command stream program if an error occurs, instead of continuing ahead as the short version does. Command Processor commands give the user additional flexibility in writing Command Stream programs by providing the following features:

Print Control—Optionally display lines of the Command Stream program as they are being executed (the short version unconditionally displays them).

Keyboard Input—Allows reading of one or more lines of input from the keyboard from within the Command Stream program.

Subroutines—Allows the user to define and call subroutines in the Command Stream program.

By using these features, some fairly complex and powerful procedures can be implemented easily.

Overall, I found *CSP* to be well documented and easy to use. By copying *CSP* and an attached Command Stream program to disk or tape, commonly used procedures, like making tape backups, can be prepackaged and executed as needed, without having to remember and enter each individual step. For the serious CoCo user, *CSP* is a powerful and useful utility to have.

(Custom Software Engineering, Inc., 807 Minutemen Causeway, Cocoa Beach, FL 32931, $19.95)

—Gary E. Epple

TRS-80 COLOR BASIC
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This book is specific to the TRS-80 Color Computer with applications using sound and graphics to illustrate how an assembler can be used to perform feats that would be quite difficult, if not impossible in the BASIC language.

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Comp-U-Trace Is Nice, But Not Worth Price

A simple yet useful tool in the programming of graphics has been packaged by All Event Video Productions. The concept behind *Compu-U-Trace* is simple. You take a sheet of clear vinyl and lay it over a picture or drawing and trace the picture with a grease pencil. The tracing is then attached to the TV screen. Now, as you program your graphics, you can follow the tracing overlay on the TV. This system bypasses the tedious work of using video screen graph paper. The idea is that the user can program better graphics more easily when the artwork is directly over the TV screen. Of course, if the artwork is much larger or smaller than your TV screen, you are out of luck.

Be warned! This is not a drawing program or a programming aid. You must still program your graphics the same old way using the usual Extended BASIC commands.

The kit is made up of three clear vinyl overlays, a mechanical grease pencil with colored leads, an instruction booklet, and a cassette tape containing a screen location program and some graphic examples. The screen location program included in the kit displays a scale (by 10s) along the top and side of the graphic screen to help in finding X-Y coordinates. For applications where you must know the exact X-Y coordinates of your graphics, as in some types of games, it would be easier to use the traditional graph paper type layout. For title pages and graphics that lend themselves to "free-hand" techniques, the tracing overlay will certainly make better graphics easier to create.

The manual briefly describes the contents of the kit and how to use it. Considering the simplicity of the system, the documentation is more than adequate. The graphic examples included on the cassette are interesting but do little to help you make your own graphics.

You must still provide all creativity and programming skills, but complex pictures are much easier when you are following a tracing. *Comp-U-Trace* can help you to improve your graphics and bring impressive graphic "scenes" within the reach of the average non-artistic hobbiest.

The big problem I have with this kit is it's rather high priced ($29.95). This is an idea that anyone could manage on their own with just a piece of clear plastic. True, packaging and documentation count for something, but this system is so simple and the supplies are so low-cost that the price being asked for *Comp-U-Trace* seems simply outrageous.

(All Event Video Productions, 333 Cirby Way, Suite 55, Roseville, CA 95678,16K Extended $29.95)

—James Ventling

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Prereader Provides Fun For Adults And Kids

When my little nephews come over to visit and play with my toys, one thing always haunts them. They want to play with the computer, too! Now I don't have a lot of software that would entertain a small child for more than five seconds. So I started to look for some really interesting young children's games. Well, the games available for those little urchins are rather sparse. What I saw didn't hold my attention for more than 10 seconds. I guessed that there might be something in the educational game area.

There are some very good titles being put out for early learning. One of them is *Prereader* from Sugar Software. In Level I, the little person plays a game of match-up. They will use colors, shapes, numbers and upper- and lowercase letters. Here they will learn to recognize the different letters of the alphabet, as well as colors. After the child has mastered Level I and has learned to associate sounds with the letters which represent them, he or she will be ready for Level II.

Level II matches single letters and consonant blends with their corresponding sounds. For example, in Level II, there will be a picture of a frog. Below it will may be the following letters: Fr Cr Fl. You then move your marker under the correct pair and press the fire button. If you are correct you will get a happy face and a happy tune. If you are wrong, you get a second try. On the third incorrect guess, up comes Mr. Unhappy face and you get an unhappy tune. The correct answer will then be pointed out. At the end of the round you are given the number of possible points and the percentage you had correct.

The graphics used in Level I are fairly good. Some of them are very creative. But lots of them are no help at all. It took me several tries to guess some of the shapes. Look out for the orange! After several times through the game, I think I figured out all of them but one. All I know is that the correct answer is S1.

There are a lot of features to make this program friendlier to younger children. First, the [BREAK] and [ENTER] keys have been disabled. Next, almost all input can come from the joystick, even the menu items. From the first menus to your final score, color and sound abound in these two programs. *Prereader* also uses Sugar Software's auto-run loader. Using the auto-run loader really simplifies things for the smaller computer users. Complete instructions are provided for transferring the two programs over to disk. Once on disk, *Prereader* will automatically use the disk when switching between programs.

I really enjoyed *PreReader*. Everything was easy to use and fun to play. I hope more publishers follow Sugar Software's ideas. The graphics are really clever and amusing, though sometimes hard to understand. *Prereader* should provide a very enjoyable evening for both parents and children.

(Sugar Software, 2153 Leah Lane, Reynoldsburg, OH 43068, 32K Extended tape, $19.95, disk $24.95)

—Walter Seay

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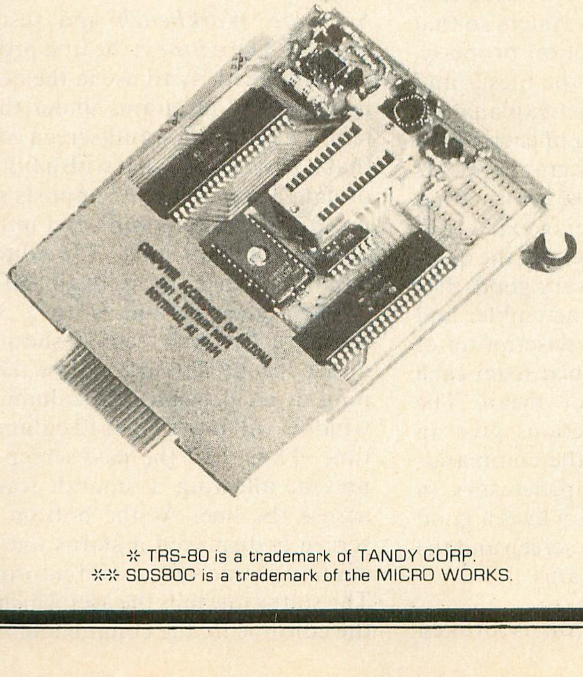

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Colour Software Workbench — A Pascal Toolbox

By Frank J. Esser

Today, there are a number of diferent compilers on the market for the Color Computer. However, none of these compilers, with the exception of one or perhaps two, supply the user with all the tools necessary to carry program development through from beginning to end. Some implementations require a separate word processor/text editor, while others require the use of someone else's assembler. None of these implementations, to the best of my knowledge support separated module or procedure development.

Colour Software Workbench is a complete PASCAL development environment. By that I mean that the *Colour Software Workbench* supplies all the items required to completely carry out program development in PASCAL. There is nothing else to purchase or have in your library. It is a tool that can be used by the experienced programmer wishing to program in PASCAL or it can be used by someone wishing to learn to program in PASCAL. However, a word of warning: The user's manual supplied with the *Colour Software Workbench* is not a tutorial; if you are setting out to learn Pascal, you will need a good general text book.

Colour Software Workbench comes on a 5-¼-inch diskette. The user manual is bound in a vinyl three-ring notebook. The diskette does not incorporate any protection features and can easily be backed up using the BASIC "backup" command.

The manual that comes with the *Colour Software Workbench* is of excellent quality and context. It is the opinion of this reviewer that the people at Deft Systems, Inc. took great pains to not only produce programs of very good quality, but they put the same care and attention to details into the supporting documentation. The manual is broken down into three distinct major sections. These sections are: *Introduction, How To* and *Background.*

The *Introduction* section gives a brief overview of just what the *Colour Software Workbench* consists of. It also gives the user a brief explanation of each of the processors that make up the development environment. Included with the explanations are excellent information flow diagrams which depict the function of each of the separate processes. One also describes the entire workbench environment.

The *How To* section is broken down into six subsections, 1) Getting Started, 2) Text Editor, 3) PASCAL Compiler, 4) Assembler, 5) Linker and 6) Debugger. Each of these sections gives a good explanation of how to run each of the processors associated with the workbench environment. The introduction section gives the user the necessary information to set up his system so that the workbench will function properly. Also included is a list of the files found on the diskette and a brief explanation of each. At the beginning of each of the sections, the pictorial diagram appears again, showing the flow of information through the processor being explained. Again, as with the first section, the quality of documentation is very good. The section on the compiler, assembler and linker gives an excellent description of the output listings obtained from each processor and what they mean. The debugger and editor sections give an excellent description of the commands available with each of the processors. In addition, the editor section lives a good description of the editor's screen and the extra information it contains.

The *Background* section is broken down into three subsections, 1) PASCAL, 2) Advanced PASCAL and 3) Assembler. The PASCAL section is a general programmers guide in that it explains the general functions and constructs of this implementation of PASCAL. It covers such subjects as program structure, constants, types, variables, procedures and functions, expressions and assignments, compound and control statements, input/output, built-in procedures and functions and error messages.

The advanced PASCAL section covers those items found in the Colour PASCAL compiler that are not found in standard PASCAL compilers. Some of these functions are strings, type extensions, absolute memory access, static variable allocation, separate compilation, assembler interface and compiler controls. The assembler section is also a programmer's guide in that it gives a general overview of the 6809 register usage, the addressing modes and a complete instruction set listing with a brief explanation of each instruction. The assembler section covers the subjects of language syntax, 6809 instruction summary, general directives, macros, linkage directives, listing control directives and error messages. Last, but not least, is the tech notes section. This section covers such items as ROM compatibility, PASCAL runtime library variations, file access from assembler, utilitites and *Colour Software Workbench* object file format. Again the documentation is easy to follow and very well written. It most definitely has the professional touch and is first class all the way.

At this point, I would like to give a brief overview of the operation of each of the processors found in the *Colour Software Workbench* and just what they do. The *editor* is the first processor you will be likely to use in the development of any programs under this system. The editor is a full-screen editor in that it presents the user with a full screen of data at one time. It supports screens up to 255 columns wide and unlimited number of lines long. The editor will handle a file size of up to 14,800 bytes.

The screen format is 16 x 32, the standard CoCo screen. A sliding window concept is used to allow the scanning of all possible 255 columns. The window will move right 12 columns at a time. Thus, half the past screen is still present allowing a smooth transition across the line. At the bottom of the screen is displayed a status line which contains some very useful information. The status line tells the user which mode the editor is in, the column and line the cursor is presently on, the length of the line the cursor is on and last, the amount of text already entered, in characters. The end of each line is marked by an orange block. The end of text buffer is marked with a blue block and the cursor is a black flashing block. The editor has an auto-repeat function which is activated by holding down a key for more than one second. The repeat functions at a rate of six characters per second. I found the one second delay to be a little too short, but the six characters per second to be more than adequate.

The editor supports both upper- and lowercase characters and can be toggled back and forth by using the [SHIFT] [0] keys. The cursor is controlled by the four direction arrow keys on the keyboard. The [CLEAR] key is used to invoke editor functions. Such functions are 1) deleting characters, 2) deleting lines, 3) getting and writing files, 4) finding and replacing text patterns and 5) quitting and reentering. Also supported are marking and moving text blocks.

The Pascal compiler is *EXEC*uted or *RUN* by typing in the following command string *LOADM*"PASCAL":EXEC. Once up and running, you are prompted for the following information.

SOURCE: (Name of the source file created with the text editor.)

OBJECT: (Name of the output object file.)

LIST: (Name of the compiler list file.)

DEBUG?: (Yes/NO — Yes means include the debugger interface.)

DIRECTIVE: (Enter any of the compiler recognize options.)

The compiler will then proceed to read in the source file and generate the machine language object output file and the listing file. Once these steps have been completed, the number of errors encountered are displayed on the screen. If zero errors are indicated, you are ready to link the object with other modules and the run time library.

If errors are present and you choose to put your listings on disk, then you will need the execute the editor and load the listing file to determine the indicated errors. The source file must then be loaded and the corrections made. The file is then resaved and the compiler run again. The process is repeated until the compiler runs error free.

A simple 45-line program I had put together took a little over 15 seconds to compile. The format of the output listings is very well explained. This version of PASCAL supports all standard PASCAL features with the major exceptions being real or floating point arithmetic and pointers. The compiler supports *IF-THEN-ELSE, WHILE, REPEAT, FOR, CASE, GOTO,* and *EXIT* control state—Ments. Also supported are standard *READLN, WRITE, WRITELN, RESET, EOF, CLOSE, AND REWRITE* I/0 statements. The type of files supported are text files and typed files. The functions supported are *ABS, CHR, PAGE,CURSOR, ODD, ORD, PRED AND SUCC.* The absence of a floating point arithmetic package limits the range of functions which can be implemented. The non-standard items supported are the following items, 1) string variables, 2) stringcopy, 3) stringdelete, 4) stringinsert, 5) stringpos, 6) encode and decode functions and 7) hex procedure.

The compiler also provides provisions to do screen formatting in a manner which is easier than that used by the BASIC interpretor. Memory cells can be read via the array function. The call function will allow access to the Color Computer's ROM routines and assemble written routines.

Variables can be defined as static or dynamic. The static variable is one which is defined at the procedure level, accessed locally only, but whose value will not change as the procedure is exited and reenterd. Dynamic variables are just the opposite. Public variables are those variables which are defined in the main module only, and can be accessed from anywhere in the program. A more common term for the public variables would be global variables.

The compiler also supports another very useful feature. That is the ability to perform separate compilations. This function alone can save the programmer hours of time spent in needless compiling of procedures and functions which have not changed since the last compiler run. thus the programmer need only be concerned with the procedure or function being updated. This concept readily supports the principal of top-down design.

A very useful second feature is the *COPY* statement. The compiler gives the programmer the ability to insert text files into the files being compiled at compilation time. Thus, he does not have to contend with the inserted section of the file during the editing of the present file. Both of these features may

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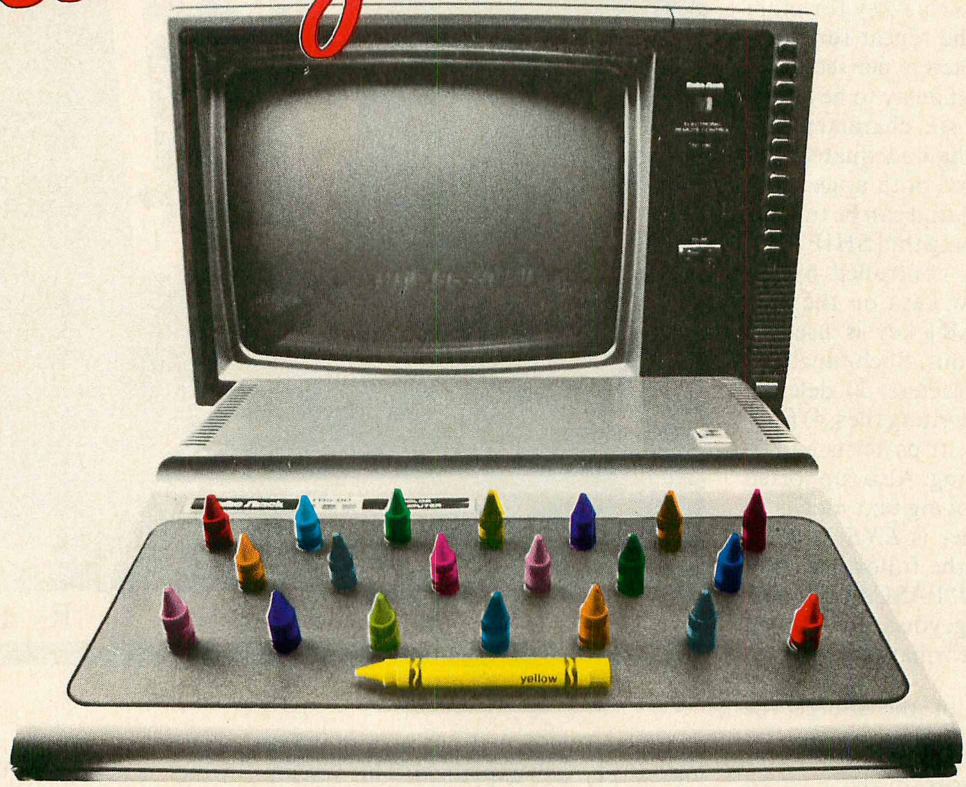

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not seem like much to the novice programmer, but they are very powerful features in the hands of an experienced programmer.

The Assembler supports the entire instruction set of the 6809 microprocessor. Macro language definition is supported and the user guide provides an excellent introduction to the concept of macro programming and the manner in which it is implemented in the *Colour Software Workbench* Also, the assembler supports such functions as page eject, list/no list, titles/subtitles and space directives. The assembler also supports the *COPY* statement as explained under the PASCAL compiler paragraph above. The assembler is executed with a *LOADM* "ASSEMBLER":EXEC command, as was the PASCAL compiler.

Once the assembler is running you are asked to supply the following information,

1) TITLE (The title heading which will appear at the top of each page of the assembler listing.)

2)SOURCE FILE: (The file containing the program to be assembled.)

3)OBJECT FILE: (The file which will contain the assembled data.)

4)LIST FILE: (The file which will contain the assembler listings.)

The *linker* is a program which will take the output of the assembler and the PASCAL compiler and combine them with the runtime library, and produce a binary output file which is capable of being loaded with the *LOADM* command and *EXEC*uted. Some of the features of the linker are, 1) object code relocation, 2) automatic PASCAL runtime modules inclusion, 3) built-in symbolic debugger interface, 4) multiple object file input, either interactively or via a control file and inary files. The linker is also executed via the *LOADM* "LINKER":*EXEC* command.

Once running, the linker asks for the following information:

1) ORIGIN: (The decimal memory address at which the program is to be loaded via the LOADM command.

2)LIST FILE: (The file which will contain the link edit map telling how the modules were put together.)

3) BINARY FILE: (The file which will contain the EXECutable output of the linker.)

4) PASCAL? (Y): (YES/NO question — Answering yes, causes the linker to include the standard PASCAL interfaces.)

5) DEBUGGER (Y): (YES/NO question — Answer yes and the debugger interfaces will be included automatically.)

6) OBJECT NAMES FILE: (If a control file is to be used, its name is entered here; if not, a null entry is required.)

7) OBJECT FILE: (The file which is to be linked. If more than one file is to be linked, the prompt returns until it receives a null response.)

The linker then reads the object files specified, includes the necessary interfaces and gets the necessary modules from the runtime library.All of these elements are then properly linked together and placed on the binary file, the result of which is a file that can be loaded and executed. Again, as before, the chapter contains a sample lising of a link edit map with full explanation.

The *symbolic debugger* is a program which will The debugger supports a full set of commands which range from display register, swords, bytes, strings, varibles, and hex to modify registers, words, allow bytes, strings and variables. Also included are such commands as clear breakpoints, evaluate, trace, to step, and quit. If the debugger interface is included at link edit time, the debugger is started automatically when the program is loaded and run. If you want to bypass the debugger for whatever reason, simply respond to the debugger prompt with a "go" and it will be bypassed. Once the program is fully debugged another program to be run in a controlled environment. and running as you want it to, the debugger can be removed by simply relink editing the program, only this time responding to the linker prompt with a "NO". The program will get smaller, but will run exactly as it did with the debugger installed.

The *Colour Software Workbench* will be able to halt execution of the program at items is a complete PASCAL program development called environment. It includes all the necessary tools for the serious programmer to produce good programs with a minimum of effort. For those who are not familiar with PASCAL, I think it provides an excellent enviroto learn it in. The ability of perform file inclusion during both PASCAL compilations and assembler runs, via the *COPY* file statement, is in itself a powerful tool. Couple this with the ability to compile singular modules and you nment breakpoints, examine the program contents, alter the conhave a trüe professional development environment.

I am totally impressed with the professional be examined quality of both the programs and the documentation. They are, in my opinion, excellent.

The package does not support floating le stepped if so point arithmetic, nor does the PASCAL implementation support pointers or relative record files. But, aside from these shortcomings, the rest of the necessary items are there. An excellent example program is included with the workbench. The example program is used to demonstrate the steps necessary to develop programs under the workbench. This program when finished is a text formatter, which will take the output of the text editor and format it any way you might want it. As a matter of fact, the user manual was prepared using the text editor and the included text formatter. Thus, the *Colour ·desired. Software Workbench* contains the follwowing items.

1) PASCAL Compiler
2) 6809 Macro Assembler
3) Linker Editor
4) Symbolic Debugger
5) Text Editor
6) Text Formatter

The whole package is quite impressive. I tried twice to reach Deft Systems Inc. to determine what, if any, future additions are in the works for the *Colour Software Workbench*, but was unable to get a return call. I am totally turned on by the package and find it more than just another PASCAL implementation.

The price may put it out of the reach of many, but I don't think it is priced to high for what one is getting. I do believe that the addition of floating point arithmetic and/or support for random file access would make it an unbeatable package. The package does support all the Color Computer peripherals, such as the printer, screen/keyboard, disks, and cassette recorder. *Colour Software Workbench* and the Color Computer are a winning team.

(Deft Systems Inc., P.O.Box 359, Damascus, MD 20872, $150 plus 3% shipping and handling)

—Frank J. Esser

Genesis Software

presents

Arcade Action

★ Q*Man

This is the challenging one! Fast-paced with hi-res graphics. Jump onto the cubes, ride the spinning discs and avoid nasty characters. Requires joystick and 32K machine language arcade game.

Tape cassette (postage paid)..............................$26.95

DESIGNER'S CHALLENGE: The first three players who reach level 9 on Q*Man will receive $25 from Genesis Software.

Adventure

★ The Enchanted Forest

The BIG adventure in hi-res graphics. Move through more than 50 scenes on a quest to rescue the captive princess. Decisions are made according to visual clues, not text. There are many inhabitants in the Enchanted Forest — some are friendly, some are not. This is a sophisticated computer adventure — a real challenge. A must for your adventure library. (Enchanted Forest was reviewed in the Dec. 1982 issue of Rainbow). Requires 32K extended basic.

Tape cassette (postage paid)..............................$21.95

★ Secret Of The Crypt

The BIG adventure continues. The sequel to the popular "Enchanted Forest" is here! You'll move in more than 50 hi-res, 3-D graphic scenes searching for clues in an attempt to enter the crypt. But beware, the trail to the crypt is beset with puzzlements. In fact, the crypt's secret will remain a mystery to all but the most adventuresome. Requires 32K extended basic.

Tape cassette (postage paid)..............................$21.95

★ Bigfoot

Hunt Bigfoot in a hidden maze of caverns and twisting tunnels that are displayed in hi-res graphics as you move. Seek out the lair of Bigfoot while avoiding perils along the way. Features multiple levels and many options of play. Each hunt takes place in a new, randomly generated maze. Challenging and fun. (Bigfoot was reviewed in the March 1983 issue of Rainbow). Requires 32K extended basic.

Tape cassette (postage paid)..............................$21.95

Family Fun

★ The Game Show

Now a lively party game where two teams compete against the clock to name several items in a category. Includes 60 rounds with color graphics and sound. Machine language routine for fast response. (Game Show was reviewed in the Jan. 1983 issue of Rainbow). Requires 16K extended basic and joysticks.

Tape cassette (postage paid)..............................$14.95

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RAINBOW CERTIFICATION SEAL

Genesis Software
P.O. Box 936
Manchester, Mo. 63011

Zeus — Electrifying, Action-Packed Fun

Those of us who did not fare well in Greek mythology will find *Zeus* to our liking because the plot for the action-packed game is quite simple! You have incurred the wrath of "the angry thunder god" and like Achilles, you must be fleet of foot to survive!

You get the idea that a storm is on the way as the credits roll on the screen, accompanied by distant thunder in one of the best opening credits sequences I've seen in a while, rivaling some TV shows.

As the action begins, you are alone on an open plain with only a shield and your "magic staff" to defend yourself. Suddenly, the air is full of lightning bolts which obviously are aimed to eliminate you. You must use the 'cone of cold' generated by your magic staff to blast the lightning bolts out of the air.

After you have survived one storm (or a level of difficulty), however, another one, even more intense, lies ahead. You will find that *Zeus* is relentless, omnipotent and one who never gives up until you are vanquished.

You'll find the first four levels fairly easy after a little practice, especially if you're a veteran of *Centipede* or *Colorpede* wars. The lightning bolts zig-zag from side to side until they're right on top of you. If they get that close, you can pull back on your joystick and, presto, a shield surrounds your body. You can only use the shield once, however.

On the fifth level, clouds appear above and you must avoid standing beneath them because they pack a powerful wallop. As you advance higher, these clouds start moving about, following your every move. It is difficult keeping track of the smaller lightning bolts while those clouds are zeroing in on you.

As you utilize your magic staff to stave off the lightning bolts, a handy meter in the lower lefthand part of the screen informs you of how much power you have remaining. If you use your firebutton for too long, the power quickly drains and you momentarily are defenseless. You soon learn not to get carried away . . . or you will be carried away.

An indicator at the top right shows how many lives you have left. You are granted another life at level five, level nine, and every three levels after that.

Pressing the "P" key allows you to pause at any time. The "R" key lets you re-enter the battle.

The game is fun, the graphics are nice, the sound effects are interesting. However, I wouldn't say that I found it to be even mildly addictive like some of the others I have experienced. And when you have played as many CoCo games as I have since last Christmas, "addictiveness" is definitely a consideration in reviewing a game's possible appeal for others. It also might be argued that such a quality is not necessarily good for your own well-being.

On a scale of 1 to 10, I would definitely give *Zeus* an 8 and hope that lightning doesn't strike!

(Aardvark Limited, 2352 South Commerce, Wallace Lake, MI 48088, $19.95 tape, $24.95 disk)

—Charles Springer

The OS-9 experts have developed something new.

C Compiler Version 2 for color computer
OS-9 DOS for color computer
Relocatable Assembler for Flex and CoCo DOS

C Compiler

Dugger's Growing Systems C is the original C Compiler for the 6809 and is the proven leader in the field. It is a growing subset of the C programming language. It runs in 20K, has assembly language output, position independent code, an extensive library in assembly language source, and code optimizer.

The Color Computer and Flex (which will run on the Color Computer) are now both available with full floating point package (float, long, for, goto, etc.) in addition to the basic C commands. CoCo Dos also contains features which use the BASIC ROM functions (cls, polcat, partial floating point, etc.).

Dugger's Growing Systems has the cost effective C for OS-9. It contains all the necessary C commands (while, if, if else, int., char, etc.) which may be linked, loaded, and used in a multi-user, multi-tasking environment.

Relocatable Assembler

The relocatable assembler package includes assembler, linker, and manager. May be used with the Color Computer or Flex.

Symbols up to 32 characters ☐ Many special characters allowed in symbols ($, %, etc.) ☐ Multiple files assembled without exiting the assembler ☐ Direct output to printer at any time ☐ Generates either absolute or relocatable modules which are linked together with RLINK to generate executables ☐ Supports two types of global variables (VAR and COMN) Fortran type common ☐ Compatible with source for most assemblers ☐ Macros with parameters ☐ Conditional assembly.

Linker

Use text-like files which are generated by RASMB or any other source ☐ Allows inclusion of multiple source files, each of which can have any number of program modules ☐ Provide for library files, whose modules are included only as required ☐ Specify at link-time execution address and global storage area for easy generation of ROM-able code ☐ Will link together both absolute and relocatable modules ☐ Extensive linkage information output on request.

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OS-9 C Compiler Version 1.2	59.95
C Programming Language, Kernighan and Ritchie	19.95

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SPLC-1, Lowercase For The Color Computer

By Jim Reed

The only definite thing I can remember about the first time I pressed [SHIFT][0] to enable the capital and lowercase letters mode on the Color Computer is my response to the inverse video: Yuk!

The first time I saw that inverse mess on the screen, I figured I must have done something wrong. It wasn't much relief to find that it wasn't my fault, because I didn't think I could ever get used to it, even though it appeared I was stuck with it.

Well, now that I am used to inverse video, I still don't care for it—even though I have found a couple of good uses for it. I'll get to those later.

My salvation, until now anyway, has been those word processing programs and other quality software offerings that use the Hi-Res screen to create their own character sets. Now, however, I can have true lowercase in BASIC's character set just by flipping a switch, any time I want to. What a difference SPLC-1 makes!

SPLC-1 is a small printed circuit board that plugs right inside your CoCo, ready for action as soon as you power up. Not only does it provide lowercase, non-inverted characters, but it also makes some needed (and a few unneeded) cosmetic changes in your uppercase as well. The beauty of it, of course, is that it's always there—you don't have to run a program or *POKE* or *EXEC* anything to enable it because it's hardwired and working unless you add a switch (or, in my case, two switches) to disable it. More on that. First, let's examine what the SPLC-1 does for your BASIC character set.

The most dramatic difference is that the old (inverse) lowercase is now true lowercase and much easier to read. Yes, true descenders, too. That is, the "tails" on the letters q,y,p,g and j reach below the line. Nice.

As for capital letters and numerals, the most obvious change is that the zero now has a slash in it, just like most printouts. Other changes are more subtle, among them: 1) the crossbar of the numeral 4 has been lowered; 2) the letter O is no longer squared off; it's oval; 3) the S has more curve to it (a big improvement); 4) the question mark is more rounded; 5) the dollar sign has a slash all the way through the s portion; 6) the asterisk looks more like an asterisk; and 7) both the pound sign [#] and the [@] now look like they do on the keyboard.

A few changes I could have done just as well without. Among these: 1) the tips of both the slash and the crossbar in the percentage sign have been trimmed off (personally, I liked them better the old way); 2) the numerals 2, 6, and 9 are more curved (to each his own); but 3) the numeral 3 is less curved and, with SPLC-1, has a flat top (making the upper half look like a z); and 4) the horizontal bars of the left and right brackets are longer even though the documentation says they should now be shorter (perhaps this has to do with my installation being in a TDP-100).

There are also a few special characters: 1) left and right braces; 2) a vertical bar (the use for which I'm at a loss); 3) a Spanish declarator symbol (~), which is also used in math to denote equivalency; and 4) an alternating dot pattern sometimes used as a delete code in RS-232 data communication.

All in all, the SPLC-1 is a big improvement. Still, while it complicated what is otherwise a simple installation—thanks to quickie instructions for the electronically adept and step-by-simple-step spoon-feeding, illustrated documentation for the novice—I elected to add a couple of switches.

Saturn Software anticipated that some of us would want to tinker around and they provided extra instructions and illustrations for those of us who weren't ready to totally commit to eliminating inverse lowercase. There are separate instructions, depending on what board you have, and while installing the board itself is easy enough, the instructions could be a lot clearer regarding adding the switches. That part of the documentation could stand consolidation and rewriting to eliminate the confusing cross-referencing it currently contains.

While some may find cutting traces and soldering in a few jumps a piece of cake, I'd just as soon the elves at the factory did it, thank you. Adding the switches probably accounts for the occasional RFI present when my SPLC-1 is in use. (Admittedly, however, my CoCo is becoming so modified the RFI could be coming from anywhere.)

So, why was I so determined to have it both ways? Both standard and inverse video. The new character set or the old standard. Well, some software, such as *Telewriter-64* and *TIMS,* uses the inverse video mode in the menu to denote which letter to hit for what command; those programs look a bit weird if you're using the SPLC-1. That is, instead of the first letter of the menu options being a capital in inverse video, you now have the initial letter of the menu option in lowercase followed by the rest of word in uppercase—eDIT, rETURN, fORMAT, etc. So, it's nice to be able to disable the SPLC-1 and use the inverse video to advantage in those instances.

Another time that inverse video is actually a real advantage is when you're debugging a program you've downloaded from a BBS. I'm sure I'm not the only one who finds that, for whatever reason, occasionally BASIC command words in the listing you've downloaded into your buffer have a few letters in lowercase and, thus, won't run. Well, it's a whole lot easier to spot them with inverse video than with true lowercase.

Two small caveats: while SPLC-1 is a hardware modification that creates a new character set for your text screen, it does not (in case you're new to CoCodom) affect the line printer's character set; that's another matter. Also—as with almost any CoCo improvement—installation of the SPLC-1 voids your CoCo's 90-day warranty.

The SPLC-1. I like it. Too bad it isn't standard equipment on every CoCo; I think anyone will find it a very pleasant added feature.

(Saturn Software, P. O. Box 357, Poway, CA 92064, $59.95)

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Which?
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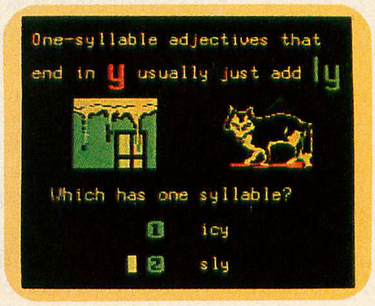

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RECEIVED & CERTIFIED

The following products have been recently received by *the Rainbow*, examined by our magazine staff and approved for the *Rainbow Seal of Certification*, your assurance that we have seen the product and have ascertained that it is what it purports to be.

This month the *Seal of Certification* has been issued to:

Business Accounting System, a 32K menu-driven accounting system that contains all of the programs required to create, update, and maintain data files and prepare the necessary accounting reports including: a Transaction Journal, a P&L or Income Report, an Interim or Trial Balance, and a Balance Sheet. Mark Data Products, 24001 Alicia Parkway, No. 207, Mission Viejo, CA 92691, disk $99.95

Paper Tractor, a 9½" x 25" clear plastic device designed to carry any paper (bond, parchment, vellum, onionskin, NCR, sheet music, etc.) through a tractor feed printer. It will hold checks, invoices, letter and legal size paper. It will load like an ordinary typewriter and requires no hardware modification. Paper Tractor, One South Fairview, Goleta, CA 93117, $11.95

Dyterm, a 16K BASIC program with ML subroutine that converts a Coco into a terminal and allows you to receive and send messages between two computers, another terminal or a modem. Dynamic Electronics, Inc., Box 896, Hartselle, AL 35640, tape $14.95, cartridge $24.95

Four Mile Island Adventure, a 16K ECB adventure game. Objective: You are trapped inside a runaway nuclear power plant. Bring the reactor to a cold shutdown and prevent the "China Syndrome." Owl's Nest Software, P.O. Box 579, Ooltewah, TN 37363, tape $17.95

Valhalla, a 32K ECB strategy game. Objective: Capture and control the opponent's castles and villages while protecting your own. HYCOMP Software, P.O. Box 15331, Tulsa, OK 74158, tape $24.95

MicroCheckers, a 4K checker game for the MC-10. Objective: Remove your opponent's pieces and be first to victory. Radio Shack Stores nationwide, tape $8.95

Big File/Fast File, a 16K ECB disk database management system. Includes a 25-page instruction manual. Moreton Bay Software, 316 Castillo Street, Santa Barbara, CA 93101, tape $59.95

More Business, a 32K ECB small business accounting program with up to 400 accounts payable, 400 accounts receivable, and more than 800 general ledger accounts. It prints invoices, profit and loss statements, and balance sheets. Includes a 130-page manual containing complete index and glossary. Moreton Bay Software, 316 Castillo Street, Santa Barbara, CA 93101, disk $99.95

Repeat Key, a 16/32K ML utility that provides the CoCo with Automatic Key Repeat. Any key held down for longer than approximately ¾ seconds is repeated at the rate of 20 times per second. Elite Software, Box 11224, Pittsburgh, PA 15238, tape $14.95

LLISTER, a 16K ML utility that provides a better formatted listing of BASIC programs (on a printer) than does the BASIC command LLIST. LLISTER provides the following formatting: Breaks each line at 75 columns to leave a right margin; indents continuation lines so that only line numbers will be at the left-most margin; skips over perforations to leave a top and bottom margin of three lines. Elite Software, Box 11224, Pittsburgh, PA 15238, tape $14.95

Shrink, a 16K ML utility that removes all unecessary spaces from a BASIC program. Elite Software, Box 11224, Pittsburgh, PA 15238, tape $17.95

Starblaze, a 16K adventure in space exploration game. Objective: As the Commander of a patrol ship, you are responsible for defending the 64 sectors of your galaxy. You must hunt down the aliens and destroy them before they ruin the galaxy's supply stations. Radio Shack Stores, nationwide, ROM pak $19.95

Micro Color Compac, an ML program which allows your MC-10 to communicate by telephone with an information service (ie, host computer) such as CompuServe or Dow Jones, Radio Shack Stores, nationwide, tape $29.95

Space Escape, a 32K ECB text adventure program. Objective: You have been taken prisoner on an alien spacecraft and you must escape and return home to Earth. Pal Creations, 10456 Amantha Avenue, San Diego, CA 92126, tape $14.95

Private Investigator, a 32K real-time text adventure/simulation. Objective: You have applied for a job as an assistant private investigator and you must put the real murderer in jail. Pal Creations, 10456 Amantha Avenue, San Diego, CA 92126, tape $14.95

Ski Lodge, a 32K ECB text simulation program. Objective: You must operate a ski lodge efficiently and make $100,000 by December 31st. Pal Creations, 10456 Amantha Avenue, San Diego, CA 92126, tape free with purchase of another program.

Mother Lode, a 32K ECB text adventure program. Objective: You have just been notified of an inheritance and must find Mother Lode to find out how much money you will receive. Pal Creations, 10456 Amantha Avenue, San Diego, CA 92126, tape free with the purchase of another program.

Better, a 32K ECB numbers betting game program for 1-4 players. Objective: To make as much money as possible before the game ends. Pal Creations, 10456 Amantha Avenue, San Diego, CA 92126, tape free with purchase of another program.

Eno, a 32K ECB text adventure program. Objective: Your eccentric old aunt just died and left you a fortune and hid it from you. You must decipher the clues given and get the cash. Pal Creations, 10456 Amantha Avenue, San Diego, CA 92126, tape free with the purchase of another program.

Match It, a 32K ECB word game program. Objective: Try and guess the computer's secret five letter word. Pal Creations, 10456 Amantha Avenue, San Diego, CA 92126, tape free with the purchase of another program

Banners, a program designed for use with the CGP-115 printer/plotter that will generate banners of up to 250 characters, in four colors and 39 character sizes. All-American Ultralight Industries, 1144 Kingston Lane, Ventura, CA 93001, tape $9.95

Test Aid, a 32K ECB utility program which allows the user to create a bank of four-alternative multiple-choice test questions; to edit the questions; to select questions from the bank for inclusion on an exam; to print a formatted copy of the exam, and to generate different orders of items for an exam. Infotools, 111 Country Club Lane, Oxford, OH 45056, tape $18

Jowst, a 16K arcade type game. Objective: Destroy enemy chickens by striking them from above with your duck. Thundervision, P.O. Box 3241, Grand Junction, CO 81502, tape $28.95

Troff, a 16K ECB arcade type game. Objective: Play four different games of survival against the computer. Thundervision, P.O. Box 3241, Grand Junction, CO 81502, tape $21.95

Xebec, a 16K Hi-Res dog fight game in 3-D. Objective: Defeat your enemy with lasers. Thundervision, P.O. Box 3241, Grand Junction, CO 81502, tape $21.95

VC, a 16K simulation of political/military warfare between guerilla forces (controlled by the computer) and pacification forces (controlled by the player). Objective: To win the hearts and minds of the people, and to cut off and destroy all Viet Cong and North Vietnamese army units operating in your province. Microcomputer Games, A Division of The Avalon Hill Game Company, 4517 Harford Road, Baltimore, MD 21214, tape $20

Mudpies, a 32K circus-type game. Objective: Maneuver Arnold out of danger's way by throwing mudpies to ward off oncoming clowns, pick up any food that might be around to keep Arnold from getting too hungry, and find an exit to escape through this circus. Computer Shack, 1691 Eason, Pontiac, MI 48054, disk $29.95

Oracle II, a ML monitor featuring a 10 byte hex or ASCII search, multiple breakpoint control, full screen display and editing of memory, is assembler and a single variable speed stepper that will step both RAM or ROM. It also features the ability to preset the location of both the monitor screen and the graphics screen and the support of all the Color Computer graphic modes and color sets. Micro Majic, P.O. Box 142, Sumner, WA 98390, tape, CoCo Verison $35.95, Flex Version $45.95

Order Entry System, a 32K sales order processing system which will give an efficient means to enter orders, print shipping papers and invoices, prepare sales reports, and monitor receivables. An ML program is included with the system to automatically enhance the monitor screen to a 51 character by 24 line display. Up to 900 products may be defined and a single disk system will hold over 600 transactions. Mark Data Products, 24001 Alicia Parkway #207, Mission Viejo, CA 92691, disk $99.95

Cartridge Dump, a 16K ECB program which allows transfer of most ROM packs to tape or disk and then the programs can be RUN from tape or disk without unplugging the disk controller. Microcom Software, P.O. Box 214, Fairport, NY 14450, tape $14.95

Colortac, a disk drive tachometer which will measure the speed of your disk drives in r.p.m.'s and gives an indication of the stability of each drive. Sunshine Software, P.O. Box 15686, Panama City, FL 32406, disk $14.95

Menu, a utility program that will run a directory with 42 filenames on the screen. Programs are selected by arrow keys. Functions include RUN, COPY, RENAME, OFFSET, KILL, EXEC, and addresses of ML programs. Sunshine Software, P.O. Box 15686, Panama City, FL 32406, disk $24.95

Zaxxon, a 32K ML game for one or two players. Objective: You are the pilot of a fighter spacecraft on a mission to destroy the Zaxxon robot. Radio Shack Stores, nationwide, tape $34.95

Airline, a 16K strategy game for one to four players. Objective: Construct a sizable empire while competing against human and/or computerized opponents. Players purchase landing rights from any one of 36 major U.S. cities, buy planes and then station them on routes that will maximize the player's revenue from fares. Adventure International, Box 3435, Longwood, FL 32750, tape $24.95

The Investor, a 16K ECB personal investment portfolio software consists of two programs; *Invvpdt* which creates and maintains a year-to-date cassette transaction file (Invdata) with up to 175 purchases, sales, dividends and stock splits for up to 24 securities. And, *Investor,* that analyzes the Invdata file of transactions, gains/losses, rates of return, etc., on individual assets or on a consolidated basis. J&A Enterprises, 74 Meadow Rd., Plymouth, MA 02360, tape $39.95

Stellar Search, a 32K ECB graphic adventure space game in four parts. Objective: As Captain of the Enterprise you must establish contact with an unknown race while the enemy tries to stop you. Owl-Ware, P.O. Box 116R, Mertztown, PA 19539, tape $27.95

FICA-83, two 16K ECB programs for calculating your approximate monthly pension check under the 1983 changes to the Social Security Act. The *FICA-83S* program is used for printout to the TV screen only; it includes a report of the FICA tax rate in applicable years. The *FICA-83P* program is used for printout to hard copy and requires a printer. Parsons Software, 118 Woodshire Drive, Parkersburg, WV 26101, tape $19.95

Star Trap, a cooperative/strategy game for ages seven and older. Objective: Chase the shooting star through the maze, learn the powers of the gates, and use your X's to trap the star. Radio Shack Stores nationwide, tape $19.95

Paint Pot, a 32K ECB program designed for creation of sketches and graphics in four colors. It is designed so that young children can draw right away, yet is powerful enough to satisfy the advanced user. Up to four screens can be stored at one time (three with 16K). There are keys to copy and animate the graphics, plus a help key. Tim Skene, 6073 Durocher Avenue, Montreal, Quebec, Canada H2U 3Y7, disk version $25

Shenanigans, a 32K Hi-Res graphic adventure game. Objective: Search for the Pot of Gold hidden by leprechauns at the end of the rainbow, avoiding danger along the way. Mark Data Products, 24001 Alicia Parkway, No. 207, Mission Viejo, CA 92691, tape $24.95, disk $27.95

The Music Reader, a 32K ECB package of programs for the beginner or persons with some ability in reading music. These seven program utilize the blend of Hi-Res graphics and text to teach you how to read music, identify notes and their lengths, and how to recognize the rests. Musical terms are covered along with measures, time signatures, key signatures (sharps and flats), the piano keyboard and how to translate notes into rhythm. Prickly Pear Software, 9234 E. 30th Street, Tucson, AZ 85710, disk $39.95

Whole Numbers, an educational program designed to give practice on addition, subtraction, multiplication, and division of whole numbers. Shamrock Software, 4382 Norton Road, Radnor, OH 43066, tape $9.95

Fractions, an educational program designed to give practice onb addition, subtraction, multiplication of fractions. Shamrock Software, 4382 Norton Road, Radnor, OH 43066, tape $9.95

Percents, an educational program designed to give practice on finding a percent of a given number, finding the percent one number is of another, and changing a fraction to a percent. Shamrock Software, 4382 Norton Road, Radnor, OH 43066, tape $9.95

Length, an educational program designed to give practice on changing from one length of unit to a different length of unit and to find the perimeter or circumference of a specific geometric shape given the proper parameters. Shamrock Software, 4382 Norton Road, Radnor, OH 43066, tape $9.95

Arena, an educational program designed to give practice on changing from one area unit to a different area unit and to find the area of a specific geometric shape given the proper parameters. Shamrock Software, 4382 Norton Road, Radnor, OH 43066, tape $9.95

Time, an educational program designed to give practice on changing from one time unit to a different time unit. Shamrock Software, 4382 Norton Road, Radnor, OH 43066, tape $9.95

Sequence, an educational program designed to give practice in putting numbers in proper numerical sequence from smallest to largest. Shamrock Software, 4382 Norton Road, Radnor, OH 43066, tape $9.95

Capacity, Liquid And Dry, an educational program designed to give practice on changing from one capacity unit to a different capacity unit. Shamrock Software, 4382 Norton Road, Radnor, OH 43066, tape $9.95

Decimals, an educational program designed to give practice on addition, subraction, multiplication, and division of decimals. Shamrock Software, 4382 Norton Road, Radnor, OH 43066, tape $9.95

Volume, an educational program designed to give practice on changing from one volume unit to a different volume unit and to find the volume of a specific solid given the proper parameters. Shamrock Software, 4382 Norton Road, Radnor, OH 43066, tape $9.95

Speed, a program designed to give practice on changing from one speed unit to a different speed unit. Shamrock Software, 4382 Norton Road, Radnor, OH 43066, tape $9.95

Weight, a program designed to give practice on changing from one weight unit to a different weight unit. Shamrock Software, 4382 Norton Road, Radnor, OH 43066, tape $9.95

RAINBOW CERTIFICATION SEAL

Math Invasion, an educational math game for ages seven and up. Objective: Math problems disguised as aliens descend upon the planet. Load your laser cannon with the appropriate answer and blast the invaders before they land. If necessary, you can instruct CADS (Computer Aided Defense System) to assist you in making the proper calculaton. Crystal Software, 6591 Dawsey Road, Rock Creek, OH 44084, tape $19.95

Keyboard a 16/32K educational program for grades 1-6 designed to help familiarize a student with the keyboard. Home keys are identified and proper fingering is taught. Lessons are built around alphabet, finger, word, and sentence drills. Both 16K and 32K versions can use data tapes for further practice. B5 Software, 1024 Bainbridge Place, Columbus, OH 43228, 16K tape $19.95, 32K tape $24.95

Keyboard Phonic Drill, a data tape to be used with *Keyboard.* Letter, word and sentence finger drills using common vowel and consonant combinations are included. B5 Software, 1024 Bainbridge Place, Columbus, OH 43228, tape $8.95

Skip Counting, a 16K educational program for grades 1-4 that helps the child learn to count by 1s, 2s, 5s 10s, 100s, or any number desired. The user selects the parameters by giving the number to count by and the beginning and ending number of each sequence. B5 Software, 1024 Bainbridge Place, Columbus, OH 43228, tape $16.95

The M.A.S. Number-Cruncher, a 16K program which performs the functions of a hand-held calculator. It can be used independently or as a subroutine appended to another financial program, allowing the user to number-crunch on the screen. Moonshot Acres Software, Route One, Box 423, Rockfield KY 42274, tape $7.95

A/BASIC Compiler, a BASIC compiler for OS-9 and FLEX that generates 6809 machine code from easy to write BASIC source prorams. It is an integer only (no floating point), version of BASIC. It can be used for games and graphics, but it has no built in functions for them. Frank Hogg Laboratory, The Regency Tower, Suite 215, 770 James Street, Syracuse, NY 13203, Object only $150

DYNASOFT PASCAL, a portable p-code implementation of a Pascal subset specifically tailored for small scale microcomputer systems. *DYNASOFT PASCAL* is a Pascal Subset which includes the control structures of standard Pascal and supports the data types INTEGER, CHAR, BOOLEAN, scalar (enumerated), subrange, pointer, and ARRAY, along with the dynamic memory management functions NEW, MARK, and RELEASE. Available for CoCo OS-9 and FLEX. Frank Hogg Laboratory, The Regency Tower, Suite 215, 770 James Street, Syracuse, NY 13203. OS-9 Object only $69.95, with run-time source $99.95, FLEX Object only $59.95, with run-time source $89.95

DYNA-C, a new Small-C derivative for OS-9 and FLEX-9 that produces compact, ROMable, position-independent, reentrant, OPTIMIZED code. Source code for the entire run time system is supplied, so you can customize to your own needs. Requires 36K of user RAM. Frank Hogg Laboratory, The Regency Tower, Suite 215, 770 James Street, Syracuse, NY 13203, OS-9 $104.95, FLEX $99.95

DSM, a 6809 Macro Assembler for FLEX and OS-9 with conditional assembly directives and other extended commands. *DSM* will allow you to support your source code files on one system and can generate OS-9 or FLEX formatted binary object code files under either disk system. Frank Hogg Laboratory, The Regency Tower, Suite 215, 770 James Street, Syracuse, NY 13203, $99

CRASMB-Macro Cross Assembler, a macro-conditional cross assembler for FLEX and OS-9. It uses machine language overlays or modules called "CPU Personality Modules" to do the work of mnemonic look up. It has directives and other extended commands. It generates OS-9 or FLEX binary files. Frank Hogg Laboratory, The Regency Tower, Suite 215, 770 James Street, Syracuse, NY 13203, Written for 6809 FLEX and OS-9 $200, CPMs (CPU Modules) $35 with source $70, or *CRASMB* with all CPU modules with source /or FLEX or OS-9 $499

Cross Assembler Macros, a set of macros for the TSC Macro Assembler (for FLEX) or the OSM Macro Assembler (for OS-9 or FLEX) provides the user with the capability of using a 6800/1/9 computer system for program development for 6800/1, 6805, 6502, 8080/5, and 280 systems, using the assembler language format normally used on the target machine. Frank Hogg Laboratory, The Regency Tower, Suite 215, 770 James Street, Syracuse, NY 13203, OS-9 $55 each or 3/$110, FLEX $50 each or 3/$100

Super Sleuth, a set of programs which enable the user to examine and/or modify binary program files on disk or in memory on 6800, 6801, and 6809 systems. *Z-80 Super Sleuth,* this version analyses Z80, 8080, 8085 object programs. Frank Hogg Laboratory, The Regency Tower, Suite 215, 770 James Street, Syracuse, NY 13203, CoCo OS-9 $49.95, CoCo FLEX $50, RS DOS $49, FLEX or OS-9 with Source $99, Uniflex $100

6800-6809 And 6809 PIC/PID Translators: The 6800-6809 translator converts 6800/1 assembly-language programs to 6809 assembly language programs by converting 6800/1 opcodes to sequences of one or more 6809 opcodes. Frank Hogg Laboratory, The Regency Tower, Suite 215, 770 James Street, Syracuse, NY 13203, FLEX $50, UniFLEX $60, OS-9 $75

Spooler, a 16K printer spooler program that prints ASCII files from disk without waiting. Chroma Systems Group, P.O. Box 366, Dayton, OH 45420, tape $11.95 or disk (with source) $15.95

Here Comes De Prez, a 32K ECB text simulation program. Objective: To win the election for President of the United States. Pal Creations, 10456 Amantha Avenue, San Diego, CA 92126, tape $14.95

Fun House, a 32K ECB text adventure program. Objective: To find your way out of the fun house. Pal Creations, 10456 Amantha Avenue, San Diego, CA 92126, tape $14.95

Scatterbrain, a 32K ECB graphic text adventure program. Objective: To place each of the 60 objects in its proper place. Pal Creations, 10456 Amantha Avenue, San Diego, CA 92126, tape $14.95

Pro-Color-File * Enhanced, a 32K new version of *Pro-Color-File 2.0,* a database program which offers the ability to track any information such as mailing lists, expense records, inventory or court trials, etc. The features include: defining up to 60 data fields; 1020 bytes per record; use of 1-4 disk drives; four color data entry screens; 28 user defined equations; scans files alphabetically; duplicate records; duplicate fields; eight report formats; summary reports; screen reports; page titles, numbering; sorts any field, three fields at once, or any size field; and selects subsets of file. Derringer Software, P.O. Box 5300, Florence, SC 29502, disk $79.95

Keyboard "Beeper" Cartridge, a general enhancement device which provides audio feedback to keyboard activity. The ESL "Beeper" was designed to respond with a soft "beep" whenever the BASIC keyboard scan routine detects a valid key closure. Included are: power indicators, version selection, visual activity indicator, switchable interrupt line, extension connector, reset switch, and audio disable. These are all housed in a standard game pack cartridge for installation into the expansion port connector of the CoCo. The user interface consists of four switches, four LED indicators, a piezo audio transducer, and an extension connector at the end of a length of ribbon cable. It is fully functional with any of the substitute keyboards available and requires no software modifications to implement or support the audio feedback feature. ENG Systems Laboratories, 8203 Springfield Village Drive, Springfield, VA 22152, $59.95

Ernie's Majik Shapes, a skills game for ages three to six. Objective: Ernie wears the top hat but you are the magician. Help Ernie match shapes in six different ways. Radio Shack Stores nationwide, tape $19.95

Edit/Assemble for OS-9, an editor and assembler package. The edit features "screen-like" line editing capabilities, and assemble is a conditional macro assembler. Frank Hogg Laboratory, The Regency Tower, Suite 215, 770 James Street, Syracuse, NY 13203, $69.95

Keeptext, a 16K ML word processing program that uses a full screen editor and full featured print formatter, including on screen help facilities. P & M Software Co., 11600 SW Frwy., Suite B-364, Houston, TX 77031, tape $29.95

Accounts Receivable Program, a BASIC program for one, two, three and four disks, and a BubbleSort routine program designed to help small or large businesses to keep track of accounts receivable files. It also allows you to print out statements from the data. PcLEAR4 Co, P.O. Box 294, Henderson, TX 75653, disk $49.95

Disk Data Handler Directory-File Builder, a short BASIC program which will read directory information from your disk and build a file of this information which may be read by Custom Software Engineering's *Disk Data Handler (DDH). DDH* may then be used for any desired sorting, selecting, or reporting. Each file produced may have over 500 directory entries, and *DDH* (in the 64K configuration) may combine these files to produce an overall index of more than 1,500 entries. *Disk Data Handler Directory-File Builder* will be supplied as a printed listing to all future *DDH* 64K purchasers at no additional cost. Old *DDH* customers may obtain a free copy by sending their program serial number and a S.A.S.E. to Custom Software Engineering, 807 Minutemen Causeway, CoCo Beach, FL 32931

Slay The Nereis, a 16K game. Objective: you are the commander in charge of three minisubs. Maneuver through murky waters destroying schools of fish, manta rays, starfish, jelly fish and the Nereis, a marine creature which excretes a paralyzing poison. Avoid gaseous bubbles and fire missiles to avoid being destroyed. Radio Shack Stores nationwide, ROM-pak, $24.95

Return Of The Jet-I, a 16K game for one or two players. Objective: Guide your speed cycle through the woods avoiding trees, rescuing bears, and destroying enemy riders. When you have successfully gotten through, you must penetrate the Emperial Power Station and destroy the power beam. ThunderVision Software, P.O. Box 3241, Grand Junction, CO 81502, tape $24.95

Hi-Resolution Screen Package, a screen formatting utility designed to improve the standard 32-character by 16-line text mode display of the CoCo. It provides formats and a true upper-/lowercase character set, allows you to have mixed text and graphic screens or separate text and graphics screens, and it allows standard terminal control characters to be used to control or communicate with the screen just like a standard video terminal. CER COMP, 5566 Ricochet Avenue, Las Vegas, NV 89110, tape $19.95

Large 3-D Letter Message Displayer, a 32K ECB program that stores and displays over 100 individually formatted messages that are readable to 50 ft. in three selectable letter styles, four colors, and is user selective. HSAC Software, 1 Fourth Street, Farmingville, NY 11738, tape $29.95

Guess the Animal, a 16K ML artificial intelligence game. Objective: Think of an animal, and this software will try to guess it using your clues as it responds with questions. Elite Software, Box 11224, Pittsburgh, PA 15238, tape $17.95

Roman Numerals: Arabic Numbers, three 16K ECB programs. Two tutorials which teach the conversion of Roman numerals to Arabic numbers and back again. The third program provides practice in conversion. Moreton Bay Software, 316 Castillo Street, Santa Barbara, CA 93101, tape $16.95

Golden Voyage, a 24K ECB adventure game. Objective: The king lies near death in the royal palace. You have three days to bring back the elixer needed to rejuvenate him. Journey through the lands of magic fountains, sacred temples, stormy seas and gold to find the elixer. Adventure International, Box 3435, Longwood, FL 32750, tape $24.95

DYNASTAR Screen Editor/Word Processor, a menu-driven screen editor equally suited to the tasks of program preparation and document processing, with the addition of the optional *DynaForm* print formatter/mail merge package. For complete word processing, the optional *DynaForm* text formatter provides all the standard features including pagination, headers and footers, single, double and multiple spacing, boldface, double-strike and underline. *DynaForm* has its own macro facility with string variables, nested include files, FULL MERGE/PRINT facilities, and automatic generation of Index and Table of Contents. Frank Hogg Laboratory, The Regency Tower, Suite 215, 770 James Street, Syracuse, NY 13203, *DYNASTAR* for OS-9 or FLEX, $149.95; *DynaForm* for OS-9 or FLEX, $149.95; or both $275, *DYNASTAR*—CoCo version, $90; *DynaForm*—CoCo version, $90; or both $175

A Guide To Food Contents, a 32K program that will list the individual serving size and contents by calories, protein, minerals, carbohydrates, vitamins, and water for a given food product. Computing & Fitness, 35080 Chander Avenue #80, Calimesa, CA 92320, disk $39.95

ELITE*WORD, a 32K ML ECB word processor that has full screen editing functions, a complete set of output format control features, and offers printed output of flexibility for home and business applications. Includes a 48-page instruction manual. Elite Software, Box 11224, Pittsburgh, PA 15238, disk $59.95

Pyramid of Doom, a 24K ECB adventure game. Objective: An Egyptian treasure hunt leads you into the dark recesses of a recently uncovered pyramid. Recover all the treasures and avoid being put into a long eternal sleep. Adventure International, Box 3435, Longwood, FL 32750, tape $24.95

Pirate Adventure, a 24K ECB adventure game. Objective: Go from your London flat to Treasure Island, meet up with the pirate and his daffy bird and try to recover Long John Silver's lost treasure. Adventure International, Box 3435, Longwood, FL 32750, tape $24.95

Mission Impossible, a 24K ECB adventure game. Objective: To complete your mission given by the computer. Adventure International, Box 3435, Longwood, FL 32750, tape $24.95

Voodoo Castle, a 24K ECB adventure game. Objective: Count Cristo has had a fiendish curse put on him by his enemies. Try and rescue him while avoiding the Voodoo man. Adventure International, Box 3435, Longwood, FL 32750, tape $24.95

The Count, a 24K ECB adventure game. Objective: You wake up in a large brass bed in a castle somewhere in Transylvania. Find out who you are, what you are doing here and why the postman delivered a bottle of blood. Adventure International, Box 3435, Longwood, FL 32750, tape $24.95

Strange Odyssey, a 24K ECB adventure game. Objective: You are marooned at the edge of the galaxy and have stumbled upon the ruins of an ancient alien civilization complete with fabulous treasures and unearthly technologies. Try and collect the treasurers and return home. Adventure International, Box 3435, Longwood, FL 32750, tape $24.95

Mystery Fun House, a 24K ECB adventure game. Objective: Find your way completely through the Fun House avoiding being kicked out when the park closes. Adventure International, Box 3435, Longwood, FL 32750, tape $24.95

Ghost Town, a 24K ECB adventure game. Objective: Explore a deserted western mining town in search of 13 treasures avoiding rattlesnakes and runaway horses. Adventure International, Box 3435, Longwood, FL 32750, tape $24.95

Savage Island—Part One, a 24K multi-part ECB adventure game for experienced adventurers. Objective: Uncover the awesome secret on a small island in a remote ocean. Adventure International, Box 3435, Longwood, FL 32750, tape $24.95

Savage Island—Part Two, a 24K ECB conclusion to Part One of the same adventure game. Adventure International, Box 3435, Longwood, FL 32750, tape $24.95

The *Seal of Certification* program is open to all manufacturers of products for the TRS-80 Color Computer, the TDP-100, or the Dragon-32, regardless of whether they advertise in *the Rainbow*. By awarding a *Seal,* the magazine certifies the program *does exist*, but this *does not* constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to *the Rainbow's* reviewers for evaluation.

—Jutta Kapfhammer

GREETINGS from
UNCLE
BERT

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By W. Bert Woofensburger

and

Dale Peterson

Greetings!

Now that winter is on top of us, I bet everybody has forgotten what a hot summer it was. I haven't forgotten, though. It was especially hot down here on the farm. I would have to say, in all seriousness, that it's not been a good year for farming. It was so hot, some of the corn tassels began mutating into the shape of parasols. It was so hot, the pigs didn't move. I mean didn't move! Well, pigs need to move; otherwise they stop multiplying. Finally, near the end of the summer, I put air conditioning in the pig house, and that worked just fine. Yes, they did start moving again, and yes, they did begin multiplying again. A lot, in fact. Unfortunately, the controls for the air conditioning were too low. A particularly clever pig, I suspect (I never actually witnessed the act), kept turning the air conditioning down, so that it was always really cold in the pig house. The pigs seemed to thrive on the cold, and so I didn't mind it too much (although it was expensive), but by the time fall came, all the mice had caught colds, and developed ear infections. How did I know they had ear infections? All the mice started running around in circles—a sure sign of ear trouble. It might have been amusing, if it hadn't been so sad. Every time I walked into the pig house, all these mice would scurry around me in circles. The pigs seemed fascinated by the mice, and after a while they started moving in circles too. I had the veterinarian check their ears—no problem there—they were just imitating the mice. There was all this circular activity and not much I could do about it. Thus, I went down to my Color Computer in the den, and started experimenting with circles.

You may remember that I have been accustomed to making "circles" by cheating—that is, by defining to my Color Computer "manysideagons," and hoping that nobody sees the difference. For example:

```
TO CIRCLAGON
  REPEAT 24 (FD 10 RT 15)
  END
```

I did a lot of experimenting with circles, going back and forth from the EDIT room to the RUN room. Then I found an easier way—these so-called "variables," where you can put a little ":" before certain parts of a program and after you've done that, you can change the numbers in those parts of the program while in the RUN mode—whenever you wish. You have to name the variable in the title of the program, and use that same name within the program, but other than that inconvenience it seemed pretty useful. So I tried it with my circle formula.

```
TO CIRCLE :SIDE
  REPEAT 12 (FD :SIDE RT 30)
  END
```

I tried 0, 20, 30, even 40. I found that at the smaller dimensions, (side 20) the circle seemed acceptable. When I got to the larger dimensions, it was clear as day that I was cheating: not defining a circle at all, but a 12-agon. What would happen if I introduced a second variable for the angle? Like this:

```
TO CIRCLE2 :SIDE :ANGLE
  REPEAT 12 (FD :SIDE RT :ANGLE)
  END
```

Then I tried running a CIRCLE2—which produced nothing. Why? I tried a CIRCLE2 10 40; and a CIRCLE2 20 10; and a few others. Whoops! The problem was, as I thought about it, that the number of times I needed to repeat the forward and turning motion depended directly upon the size of the angle. Repeating everything 12 times is great—as long as the turning angle is 30. Twelve times 30 makes 360, and I guess past experience shows that the turtle needs to be turning a total of 360 degrees to make that circle and return to where it started. I thought and thought. What do I normally do to find out how many times I need to repeat an angle to reach 360? Answer: divide. Divide 30 into 360 and I get 12. Well, could I use the computer to do my dividing for me? Answer (I won't tell you how I found this one out): yes. Try this:

```
TO CIRCLE3 :SIDE :ANGLE
  REPEAT 360/:ANGLE (FD :SIDE RT :ANGLE)
  END
```

That was great, and it enabled me to experiment with circles very easily. I tried CIRCLE3 20 30; CIRCLE3 30, 40; CIRCLE3 30 10. I discovered what I should have already known: increasing the size of the angle makes the circle smaller, not bigger. At first, all the angles I put in easily divided in to 360—I didn't want to tempt fate and have something go wrong. After a while, I got bolder and decided to tempt fate. I tried to run CIRCLE3 10 17. It looked okay. I ran CIRCLE3 10 18 right over the 10 17; and discovered there was a difference between the two.

I tried a few more numbers—CIRCLE3 20 20; CIRCLE3

(W. Bert Woofensburger ("Uncle Bert") manages his own hog and corn farm near Ypsilanti, Mich. He has recently acquired a Color Computer and is learning LOGO. Woofensburger's editor and assistant, Dale Peterson, writes for a living, and his recent books include "Genesis II: Creation and Recreation with Computers" and "Intelligent Schoolhouse: Readings On Computers and Learning." He is currently working on a book about Color LOGO with Don Inman and Ramon Zamora, to be published in 1984.)

60 60; CIRCLE3 20 90; CIRCLE3 90 120; and demonstrated once and for all that these "circles" are not really circles at all, but manysideagons. Yes, and thank you Catherine: that little ninny really can't make a circle.

* * *

Now for something different. I got tired of dealing with lines, and decided to add a fancy brush stroke to my turtle's palette. I created the brush stroke in the following manner.

```
TO HALFVINE
  RD 6 RT 30
  REPEAT 6 (FD 4 RT 20)
  RT 60
  REPEAT 6 (FD 4 RT 20)
  RT 30
  END

TO OTHERHALFVINE
  FD 6 LT 30
  REPEAT 6 (FD 4 LT 20)
  LT 60
  REPEAT 6 (FD 4 LT 20)
  LT 30
  END

TO VINE
  HALFVINE OTHERHALFVINE
  END

TO GROWVINE
  REPEAT 10 (VINE)
  END
```

That was great fun. I thought next I'd try sending the vine in a circle. I looked at some of my earlier circles, and decided to try this:

```
TO CIRCLEVINE
  REPEAT 12 (FD 10 VINE RT 30)
  END
```

That was neat. However, it still wasn't quite what I wanted. I wanted those leaves to be packed tightly together, just as they are in a real vine. As the instructions had it, the turtle moved forward 10, did a "vine" then turned and moved again. What would happen if I cut out the forward motion, and just had it depend on the little forward motion inside the vine procedure? Like this:

```
TO CIRCLEVINE2
  REPEAT 12 (VINE RT 30)
  END
```

And this:

```
TO CIRCLEVINE3
  PC 1 REPEAT 30 (VINE RT 12)
  END
```

Well, after that I got brave and decided I would try to do some circlevines using the kinds of variable procedures I had just been messing with. I knew right away how my angle variable would work; all I had to do was specify :ANGLE. But how could I specify the side length? After all, the side length I had just been using was the standard length of one section of vine. I thought and thought and came up with the

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idea that maybe I could define my side length like this: REPEAT :SIDE (VINE). With that instruction, the length of a side would just be a number I had chosen for my variable multiplied times the original length of one section of vine. Make sense to you? Anyhow, it seemed a little complicated, because my procedure for a circle had one REPEAT in it to begin with, and this would mean sticking a repeat inside of a repeat. Would it work? I tried it:

```
TO CIRCLEVINE4 :SIDE :ANGLE
   REPEAT 360/:ANGLE (REPEAT :SIDE (VINE)
    RT :ANGLE)
   END
```

I tried it with several combinations of numbers. CIRCLEVINE4 10 10 was like a jungle. Maybe the angle was too small. I tried a more modest CIRCLEVINE 4 10 60. Still a jungle. I had to remind myself that the length number (10) was not the same as the usual length for a turtle move, but was really 10 times the length of a single section of vine. So I tried a more modest length, with CIRCLEVINE4 3 60. That was interesting; I got a vined "sixagon," just as I should have expected. I tried CIRCLEVINE4 2 30 for something closer to a circle. I also tried a square: CIRCLEVINE4 6 90. Next, I decided to get fancy. I added color, and flipped the vinedesign around:

```
TO DEVINE :SIDE :ANGLE
   PC 1 CIRCLEVINE4 :SIDE :ANGLE
   LT 180
   PC 2 CIRCLEVINE4 :SIDE :ANGLE
   END
```

I was getting a headache with thinking about all these variable ideas, so I decided just to goof off:

```
TO GOVINE
   PC 1 LT 30
   REPEAT 100(VINE)
   END

TO GOGOVINE
   LT 45
   REPEAT 50 (PC 1 VINE PC 2 VINE)
   REPEAT 100 (PC 3 VINE)
   END
```

I was getting mighty impatient with the turtle—he or she seemed so slow. Just at that moment, though, the mailtruck came to the door with a big sack of mail from my readers. What do you think the first letter I opened said? It was from Sharon S. of Hingham, Mont. She said: "If you hide the turtle (HT), it'll go faster." So I tried it:

```
TO GONEVINE
   HT LT 45
   REPEAT 100 (PC 1 VINE)
   LT 45
   REPEAT 21 (PC 0 VINE)
   LT 45
   REPEAT 35 (PC 2 VINE)
   END
```

Nice. And, having mastered variables, I figured I would try some of these, as icing on the cake:

```
TO GV :NUM :ANG1 :ANG2 :ANG3
   HT
   LT :ANG1
   REPEAT :NUM (PC 1 VINE)
   LT :ANG2
   REPEAT :NUM (PC 2 VINE)
   LT :ANG3
   REPEAT :NUM (PC 0 VINE)
   END
```

By that time I had had enough of circles and vines and everything else. I was tired. I lay down on the couch for just a moment, and fell asleep. Next thing I knew, it was tomorrow. Well, I have a lot more to tell you, but I hear thunder—Bertha must be calling. I remain,

Uncle Bert

P.S. Mr. Bob V. D. P. of Edmonton, Alberta has come up with a way to get hardcopy printouts of turtle pictures from his disk system. I haven't tried it out because I only have a cartridge, but Bob's handwriting looks honest. Here it is:

Before loading LOGO type in the following:

```
POKE 113,0 [ENTER]
```

Now LOADM"LOGO" and *EXEC* the program. When you have your masterpiece finished, press the reset button on the back of the computer. You should now get the Disk BASIC Copyright notice. Now type in:

```
FILES 0 [ENTER]
```

To see your picture, run the following program:

```
10 PMODE 40,0
20 SCREEN 1,0
30 GOTO 30
```

This picture can be saved to a disk with the following commands:

```
SAVEM "PICTURE" ,3072, 9216, 0 [ENTER]
```

It can be loaded back with the following program:

```
10 PMODE 4,0
20 SCREEN 1,0
30 OF=PEEK(188)*256+PEEK(189)-3072
40 LOADM"PICTURE",OF
50 GOTO 50
```

Since we are loading the picture in with an offset, it should end up at the normal graphics screen location without the FILES 0 command. This picture can be sent to a printer using the appropriate screen dump utility. Some utilities may expect the screens to start at memory location 3584. If this is the case with yours, save the program to disk, then reload it with the program given above. Everything should be okay now.

P.P.S. You can send your cards and letters to me in care of my good friend Dale Peterson. Just address them like this:

Uncle Bert Woofensburger
c/o Dale Peterson
the Rainbow
9529 U.S. Highway 42
P.O. Box 209
Prospect, KY 40059

Hint . . .

Bob Rosen of Spectrum Projects offers this tidbit: "To show the most memory in a Color Computer, type *CLEAR0: POKE*32,0 and [ENTER]." Then, when you type *?MEM*, a 32K or 64K CoCo will report 32754! A 16K will indicate 16370. This moves the pointers used by the *MEM* command to the bottom of RAM where total memory is displayed; however, this additional memory is not usable.

THE UN-DISK

Now . . .
VDUMP
A utility to
load and save all
your memory!
$14.95

UN-BELIEVABLE

But true! There *is* a disk drive in your Color Computer . . . and it is faster and more efficient than any "hardware" drive you can buy, for any price. This new "disk drive" is called VDOS—for Virtual Disk Operating System—and it will absolutely revolutionize the way you operate your CoCo.

VDOS lets you use the "extra" memory inside your CoCo as a virtual disk, with programs (any programs) stored out of the way. You can "save" and "load" programs from your in-memory disk into working memory, and then run them. When you're done, you can simply access your in-memory disk again . . . and save or load another, and another.

And VDOS is fast. Because you are using memory rather than a mechanical device (like a disk drive or cassette player), programs load instantly. Yes, VDOS is faster than a disk!

VDOS works with all Color Computers—from 16K non-extended to 64K extended. Obviously, the more memory you have, the greater number (and length) of programs you can store. For a 64K system, VDOS also uses the "unused" part of memory, providing up to 50,000 bytes of storage! Now, that's some disk!

We call it VDOS because in the future there will be utilities for your VDOS UNDISK that will give even greater capabilities—such as a full one-pass memory dump to cassette. Other utilities are planned, too.

We believe VDOS is the greatest advancement for CoCo since the introduction of the disk drive itself. And, at less than $100, it is so inexpensive you can't afford to be without it. If you have the "cassette blues," VDOS *is* the answer!

Finally, VDOS is simple to operate. It is entirely self-prompting and comes with a complete manual. But you almost don't even need the instructions—it requires absolutely no technical expertise.

VDOS. The answer to your prayers.

Cassette: $49.95 Add $1.50 shipping and handling; Canadians add $5 for shipping; Foreign points add $9. VISA and Master Card accepted. All Kentucky residents add 5% sales tax. Payments accepted in United States currency only.

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RAINBOW
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RAINBOW

Give us your best: Join the ranks of these courageous CoCoists in showing the Color Computer world your high score at your favorite micro-diversion. We want to put your best effort on record in *the Rainbow's* Scoreboard column. All entries must be received by the first of the month to be eligible for the following month's Scoreboard. Each individual is limited to three score entries per month. Send your entries to Scoreboard, c/o *the Rainbow.*

★ **New Number One** • **Last Month's Number One**

ALCATRAZ II *(Spectral Associates)*	
18,790	★Chris Sweet, Harvard, MA
8,710	Kanti Dinda, Kingston, Ontario

ANDROID ATTACK *(spectral Associates)*	
25,000	★Wes Hill, Vashon, WA
15,500	Cameron Amick, Reisterstown, MD

ASSAULT *(Computer Shack)*	
1,100	★Kevin Mesecher, Ft. Walton Beach, FL

ASTEROID	
2,322	★Matt McMann, New Boston, MI

ASTRO BLAST *(Mark Data)*	
158,000	★Larry Plaxton, Medley, Alberta
157,000	Scott Drake, Pine City, NY
104,464	Jim Baker, Florissant, MO
98,000	Tim Warr, Bellingham, WA
92,000	Harry Sawyer, Watchung, NJ

AVENGER *(The Cornsoft Group)*	
32,285	★Kentucky Wonder Bean
24,575	●Rich McGervey, Morgantown, WV
19,480	Jim Sparke
19,220	Vince Lok, Mississauga, Ontario
16,310	Dave Lubnow, Sussex, NJ

BIRD ATTACK *(Tom Mix)*	
306,050	★Lenny Munitz, Bellerose, NY
200,725	●Peter Niessen, Carlisle, MA
110,850	Chris Sweet, Harvard, MA
66,425	Brad Widdup, Dundas, Ontario

BLEEP	
105	★Matt McMann, New Boston, MI

BLOC HEAD *(Computerware)*	
387,800	★Tim Ellis, Overland Park, KS
286,900	Ron Moore, Greensburg, PA
229,500	Kevin Delisle, N. Adams, MA
153,825	Greg Redden, Halifax, NS
142,175	Joey Ray, Durham, NC
134,550	Wesley Bull, Vanscary, Saskatchewan
83,350	Geno Beniek, Rice, MN
79,000	Kathy Wiggenhorn, Coral Springs, FL

BUSTOUT *(Radio Shack)*	
42,000	★Derrick Kardos, Colonia, NJ
34,700	Sara Hennessey, Golden Valley, MN
28,720	Perry Denton, New Baden, IL
27,880	Mike Wells, Pittsburgh, PA
18,403	Brad Widdup, Dundas, Ontario

BUZZARD BAIT *(Tom Mix)*	
267,700	★Richard Buttermore, Grand Rapids, MI
235,670	Kentucky Wonder Bean
217,800	Chris Alexander, Grand Rapids, MI
217,750	Doreen Buttermore, Grand Rapids, MI
187,850	Steve Sentell, Seymour, TN
185,050	George Endicott, Huntsville, AL
116,450	●Steve Sentell, Seymour, TN
102,050	Bill Jordan, Nashville, TN

CANYON CLIMBER *(Radio Shack)*	
999,900	★Andre Wagner, Bangor, PA
615,500	Randy Hankins, Tabor, FL
615,500	Bart, Tabor, FL
612,100	Donut, Tabor, FL
163,000	Gordy Dow, Bellevue, WA
150,000	Tim Wiechmann, Marblehead, MA

CATCH 'EM *(Aardvark)*	
237,000	★Craig Edelheit, W. Bloomfield, MI
91,000	Dean Bouchard, Kingston, N.S.
70,157	Kirk Beler, Taber, Alberta
65,768	Laura Sandman, Louisville, KY

CATERPILLAR *(Aardvark)*	
180,627	★Brian Panepinto, Spencerport, NY
86,304	Lawrence McElligott, Lancaster, CA
75,861	Michael McClure, Goose Creek, SC
63,100	Todd Byington, N. Salt Lake, UT
54,608	Lawrence McElligott, Lancaster, CA

CAVE HUNTER *(Mark Data)*	
42,600	★Gary Ritchie, Bellevue, Alberta
40,600	Lori Raskob, Esalon, CA
27,050	Jim Baker, Florissant, MO
26,300	Mike Hughey, King George, VA
21,150	Jim Baker, Florissant, MO

CHOPPER STRIKE*(Spectral Associates)*	
209,200	★Larry Seida, Univ. of Mn
8,710	Kanti Dinda, Kingston, Ontario

CLOWNS & BALLOONS *(Radio Shack)*	
85,680	★Teresa Stutsman, N. Little Rock, AR
83,710	Don Fraser, Shakope, MN
79,920	Tim Wiechmann, Marblehead, MA
77,910	Dan James, Clearwater, FL
74,920	Sal Barlett, Mesa, AZ
47,860	Paul Campbell, Richland, MI

COLOR CUBES (Radio Shack)	
4:50	★John Handis
6:05	Chris Cope, Central, SC

COLOR HAYWIRE *(Mark Data)*	
22,050	★Jim Baker, Florissant, MO
17,850	Brian Wallingford, Fall River, MA
14,850	Michael Rhattigan, Cary, NC
14,800	Brad Widdup, Dundas, Ontario
14,750	Rich McGervey, Morgantown, WV

COLOR INVADERS *(Computerware)*	
240,700	★Roland Hendel, Mississauga, Ontario
227,050	John Osborne, Kincardine, Ontario
217,635	Jim Baker, Florissant, MO
126,350	Perry Denton, New Baden, IL
93,510	Rich McGervey, Morgantown, WV

COLOR METEROIDS *(Spectral Associates)*	
1,496,000	★Craig Edelheit, W. Bloomfield, MI
1,253,200	Jeff White, Prairie de Chien, WI
292,000	Roland Hendel, Mississauga, Ontario
292,000	Vince Lok, Mississauga, Ontario
297,100	Kentucky Wonder Bean

COLOR OUTHOUSE *(Computer Shack)*	
35,908	★Ron Rhead, Ontario, Canada

COLORPEDE *(Intracolor)*	
10,000,000	★Roland Hendel, Mississauga, Ont.
3,355,248	Scott Drake, Pine City, NY
2,745,982	Roland Hendel, Mississauga, Ontario
2,547,299	Rich McGervey, Morgantown, WV
2,471,342	Vincent Lok, Ontario,
129,301	Bryan Jenner, Caigary, Alberta
54,676	Randell Walker, Dunbar, WV

COLOR SCARFMAN *(The Cornsoft Group)*	
976,520	★Bruce Thornhill, Barrhead, Alberta
772,000	Keith Seifried, Greenville, OH
600,410	Roland Hendel, Mississauga, Ontario
539,100	Larry Plaxton, Medley, Alberta
530,200	Alan Klotzback, Plainesville, OH

COLOR ZAP *(Spectral Associates)*	
227,330	★Ron Rhead, Willowdale, Ontario
84,400	Chris Sweet, Harvard, MA
82,710	Neil Berkman, DeWitt, NY
50,800	Scott Sehlhorst, Columbia, SC

COLOUR PAC ATTACK *(Computerware)*	
472,465	★Jim Baker, Florissant, MO
211,000	Roland Hendel, Mississauga, Ontario
210,875	Mark Nichols, Birsay, Saskatchewan
193,000	Cameron Amick, Reisterstown, MD
189,540	Mark Nichols, Birsay, Saskatchewan

CONQUEST OF KZIRGLA *(Rainbow Connection Software)*	
50,199	★Bruce Uher, Coshocton, OH
13,155	Lee Rice, Crystal River, FL
10,399	Scott Sehlhorst, Columbia, SC

COSMIC CLONES *(Mark Data)*	
41,300	★John Osborne, Kincardine, Ontario

CROSSWORDS *(Radio Shack)*	
864	★Bob Strang, Chicago, IL

DEATH TRAP *(Soft Sector)*	
89,035	★Keith Philabaum, Coschocton, OH
84,672	Jeff Willard, Chiceno, TX
78,234	Richard Grondin, Flint, MI
75,431	Jeff Willard, Chireno, TX
60,838	M. A. Brickler, Allen Park, MI
52,672	Little Bart, Tabor, FL

DEFENSE *(Spectral Associates)*	
68,750	★M. A. Brickler, Allen Park, MI
58,900	●Greg Scott, Orlando, FL

DOODLEBUG *(Computerware)*	
3,011,320	★Brenda Gaetz, Gillane, Manitoba
2,248,840	Donut, Tabor, IA
2,191,110	Eugene Shinkewski, Prince Albert,
1,597,701	Tim Brown, Clio, MI
1,580,000	J.W. Panks, Indianapolis, IN
355,440	Bette Munitz, Bellerose, NY

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605,890	Peter Sherburne, Highland, CA
474,040	Paul Moritz, Butte, MT
435,570	Phillippe Morsan, St. Jerome, Quebec
429,000	Steve Damm, Phoenix, AZ

DUNKEY MUNKEY *(Intellectronics)*	
3,214,200	★Rich McGervey, Morgantown, WV
1,924,000	Andrew Herron, High Point, NC
1,679,400	Brian Jones, Story City, IA
1,618,800	Bryan Bloodworth, Federal Way, WA
1,437,200	Mike Wells, Pittsburgh, PA

FAST LANE *(Ace Soft Computer Products)*	
23,782	★Philip Deen, Enterprise, FL
93	Marie Love, Columbia, SC

FIRECOPTER *(Adventure International)*	
113,880	★Steve Skrzyniarz, Tacoma, WA
89,260	Robbie Black, Winnipeg, Manitoba
74,640	Cameron Amick, Reisterstown, MD

FLYBY	
4,820	★Michael Foley, N. Quincy, MA
4,480	Jim Partridge, Clinton, CT
3,875	Darren Edumura, Kamloops, B.C.
3,670	●Cameron Amick, Reisterstown, MD

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73,350	★Evelyn Gagnon, Ontario, Canada
69,710	Jeannie Hawkins, Deltona, FL
66,480	Jeannie Hawkins, Deltona, FL
46,560	Eileen Kaakee, Royal Oak, MI

FROGGER *(The Cornsoft Group)*	
63,800	★Carmen Thew, Surrey, B.C.
32,010	●Laura Schooley, Richmond, VA
25,425	Kanti Dinda, Kingston, Ontario
20,745	Felicia Schooley, Richmond, VA
19,485	Rona Kleefman, Deha, B.C.

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3,735	★Aaron T. Cincotta, Peru, IN

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14.080	Alan Weiss, Summit, NJ
11,200	Jim Partridge, Clinton, CT
10,370	Jim Baker, Florissant, MO
8,550	Tom Eberhardt, Fairview Park, OH

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54,300	Hans Haimberger, Freewater, Ontario

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58,000	Terry Steen, San Bernadino, CA
55,360	Donald Thompson, Lubbock, TX
54,200	Mike Hughey, King George, VA
54,000	Craig Edelheit, W. Bloomfield, MI
26,350	Mike Long, Kent, WA
19,910	Paul Campbell, Richland, MI
11,840	James Andrew, Kissimmee, FL

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104,550	★Mitch Hayden, Univ. of MN.
82,650	●Steve Hargis, Tucson, AZ
73,000	Wes Hill, Vashon, WA
66,750	Jim Wolf, South Bend, IN
65,700	Steve Otis, Graham, WA
50,050	Richard Wasseiman, Brooklyn, NY

SCOREBOARD

GALACTIC TREK
19,750 ★Wesley Bull, Vanscoy, Saskatchewan
GERM *(Chromasette)*
374 ★Michael Foley, N. Quincy, MA
GHOST GOBBLER *(Spectral Associates)*
1,007,430 ★Todd Brannam, Charleston Hts., SC
825,250 Randy Gerber, Wilmette, IL
423,390 Rich McGervey, Morgantown, WV
255,000 John Osborne, Kincardine, Ontario
210,500 Roger Buzard, Lima, OH
94,690 Bette Munitz, Bellerose, NY
18,650 Joyce Isbell, Toccoa, GA
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40 ★Matthew Brenengen, Lakelmo, MN
GRABBER *(Tom Mix)*
440,000 ★Casey Stein, Binghamton, NY
79,850 Blossom Mayor, East Greenbush, NY
60,600 Doug Rodger, Harvard, MA
49,000 Curtis Boyle, Sashatoon, Saskatchewan
GRANPRIX *(Computerware)*
5,875 ★Steve Skrzyniarz, Tacoma, WA
HAIDER KHAZEN
81,000 ★David Karam, Austin, TX
HALL *(Chromasette)*
3,650 ★Michael McCafferty, Idaho Falls, ID
ICEMASTER *(Arcade Animation)*
121,775 ★Saul Munitz, Bellerose, NY
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1,334,300 ★Richard Grondin, Flint, MI
502,360 John Osborne, Kincardine, Ontario
32,600 Harry Sawyer, Watchung, NJ
16,300 Eric Lund, Millington, NJ
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1,115,300 ★Ryan Van Manen, Grand Rapids, MI
144,200 Rich Van Manen, Grand Rapids, MI
96,200 Johnny Fritsch, Whitehall, PA
KATERPILLAR ATTACK *(Tom Mix)*
3,259,620 ★Jamie Gritton, Irvine, CA
163,526 ●Andy Truesdale, Ferguson, MO
109,247 Jamie Gritton, Irvine, CA
20,530 Jennifer Parry, Batavia, IL
14,375 Norbert Berenyi, Northvale, NJ
14,000 Tim Brown, Clio, MI
8,057 Saul Munitz, Bellerose, NY
KEYS OF THE WIZARD *(Spectral Associates)*
640 ★Steve Skrzyniarz, Tacoma, WA
506 Greg Burke, Kenora, Ontario
THE KING *(Tom Mix)*
10,000,000 ★Roland Hendel, Ont.
5,112,900 Donut, Tabor, IA
4,040,300 Andy Truesdale, Ferguson, MO
2,410,200 Candy Harden, Birmingham, AL
2,213,000 James Quadarella, Brooklyn, NY
755,100 Brad Gaucher, Hinton, Alberta
307,000 Granville Bonyata, Tallahassee, FL
180,000 Johnny Fritsch, Whitehall, PA
117,200 Randell Walker, Dunbar, WV
KRON *(Oregon Color Computers)*
62,470 ★James Hill, Eugene, OR
62,100 ●James Hill, Red Bluff, CA
KOSMIC KAMIKAZE *(IMB)*
200,550 ★Fred Iha, Columbus AFB, MS
62,250 Beth Walker, Gloucester Pt., VA
55,000 Paul Morris, Richland, WA
49,900 Mark Raphael, Englishtown, NJ
30,450 Jeff Teague, Noblesville, IN
LANCER *(Spectral Associates)*
2,354,000 ★Alex State, Las Vegas, NV
474,250 ●Mike Rausch, Denver, CO
469,400 Jeff Jackson, Littleton, CO
462,100 Scott Jackson, Littleton, CO
183,050 Larry Sandhaas, Springfield, IL
171,100 Don Hammack, Lonbg Beach, MS
133,300 Rip Loomis, Long Beach, MS
129,700 Doug Burke, Kenora, Ontario
95,750 Jamie Gritton, Irvine, CA
LUNAR ROVER PATROL *(Spectral Associates)*
46,800 ★Daniel Milbrath, Ann Arbor, MI
45,500 Kevin Davidson, Easley, SC
43,400 Dann Fabian, Crestview, FL
MEGA-BUG *(Radio Shack)*
60,000 ★Robin Worthem, Milwaukee, WI
16,632 John Tiffany, Washington, D.C.
15,999 Ed Mitchell, Ragged Mountain, CO
14,297 Aleisha Hemphill, Los Angeles, CA
13,852 Ryan Van Manen, Grand Rapids, MI
13,505 Paschal Wilson, Kentwood, LA
5,680 Don Hammack, Long Beach, MS
MEGAPEDE *(Computerware)*
94,085 ★Mark Eimer, Oceanside, CA
89,036 Mark Skala, Fairview, PA
67,605 Ed Bottini, St. Louis, MO
58,070 Rich Van Manen, Grand Rapids, MI
55,291 Ryan Van Manen, Grand Rapids, MI
METEOROIDS *(Spectral Associates)*
140,210 ★Fred Iha, Columbus AFB, MS
METEORS
403,000 ★Jimmy Chan, Kincardine, Ontario
17,810 Lenny Munitz, Bellerose, NY
13,120 Jennifer Klamp, Winter Park, FL
MICROBES *(Radio Shack)*
318,830 ★Hwan Joo, Weston, Ontario
316,200 Steve Mayer & Keith Seifried, Greenville, OH
259,700 Sheila Coleman, Griffin, GA
258,150 Rick Van Manen, Grand Rapids, MI
244,700 Ian Waters, North Hero, VT
61,000 Mike Long, Kent, WA
MR. MUNCH
40,000 ★Wes Hill, Vashon, WA
20,000 Scott Drake, Pine City, NY
MONKEY KONG *(Med Systems Software)*
1,000,000 ★Wes Hill, Vashon, WA
1,876 Kanti Dinda, Kingston, Ontario
1,323 Ryan Van Manen, Grand Rapids, MI
1,210 Susan Brink, Portage, MI
1,185 Mike Fath, Wadsworth, OH
MONSTER MAZE *(Radio Shack)*
520,470 ★Robert L. Bull, Trenton, Ontario
323,490 Philip Morrissey, Gilboa, NY
200,000 Daniel Milbrath, Ann Arbor, MI
150,000 Jamie Gritton, Irvine, CA
130,780 Dylan Kucera, Manitoba
61,720 Paschal Wilson, Kentwood, LA
MOON HOPPER *(Computerware)*
6,210,000 ★Vincent Lok, Ontario
809,750 Ed Bottini, St. Louis, MO
142,800 Ron Rhead, Willowdale, Ontario
122,500 Donut, Tabor, IA
119,790 Bart, Tabor, IA
111,690 Randy Hankins, Tabor, IA
105,440 G.I. Jody, Tabor, IA
MOROCCO GRAN PRIX *(Computerware)*
4,153 ★Frank Bottini, St. Louis, MO
2,344 Cameron Amick, Reisterstown, MD
NERBLE FORCE *(Computerware)*
315,150 ★Frank Bottini, St. Louis, MO
49,200 Jim Ganninger, Des Peres, MO
NIBBLER *(Color Quest)*
20,650 ★Rick McGervey, Morgantown, WV
14,910 Christal Glovinsky, Staten Island, NY
NINJA WARRIOR *(The Programmer's Guild)*
74,500 ★Greg Burke, Kenora, Ontario
42,400 Daniel Milbrath, Ann Arbor, MI
46,400 Jeff Willard, Chireno, TX
32,900 Rip Loomis, Long Beach, MS
28,200 Don Hammack, Long Beach, MS
26,400 Perry Willard, Chireno, TX
OFFENDER *(American Business Computers)*
999,900 ★Scott Drake, Pine City, NY
965,400 Jim Baker, Florissant, MO
406,800 Betty Moore, Greensburg, PA
293,900 Marla Moore, Greensburg, PA
273,900 Walt Moore, Greensburg, PA
PAC-ATTACK II *(Computerware)*
107,070 ★Mark Skala, Fairview, PA
88,860 Michael J. Garozzo, Morrisville, PA
62,870 Stanley Sneed, Erwin, TN
44,000 Robert Lang, Port McNeill, BC
42,045 Dave Lubnow, Sussex, NJ
PAC-DROIDS *(The Programmer's Guild)*
1,476,730 ★Joshua Josephson, Corning, NY
577,140 Richard Cochrane, Wayne, NJ
197,490 Joe Minkstein, Jr., Half Moon Bay, CA
151,590 Annita Powell, Huber Heights, OH
140,300 John Yapp, Park Forest, IL
PACET-MAN *(American Business Computers)*
26,800 ★Vince Lok, Mississauga, Ontario
14,050 Susan Brink, Portage, MI
7,200 Fred Iha, Columbus AFB, MS
5,000 Cameron Amick, Reisterstown, MD
3,392 Norbert Berenyi, Northvale, NJ
PARACHUTE JUMP *(JARB Software)*
451,000 ★John Osborne, Kincardine, Ontario
PATTIPAK *(Petrocci Freelance)*
33,545 Bruck Kothmann, Pittsburgh, PA
PHANTOM SLAYER *(Med Systems)*
2,488 ★Troy Messer, Joplin, MO
1,852 Curtis Boyle, Saskatoon, Saskatchewan
1,306 Marc Hassler
604 J. Powell, Bournemouth, England
406 Imre Kertesz, Chandler, AZ
PICNIC *(Computer Island)*
100,000 ★Scott Drake, Pine City, NY
1,220 Jon Bauch, South Fallsburgh, NY
PINBALL *(Radio Shack)*
6,000,000 ★Jimmy Oliver, Hants City, NS
4,000,000 Keith Seifried, Greenville, OH
2,111,900 Dale Westmoreland, Lannon, WI
1,266,250 Donut, Tabor, IA
300,250 Brad Widdup, Dundas, Ontario
PLANET INVASION *(Spectral Associates)*
483,250 ★Chris Sweet, Harvard, MA
286,075 Larry Plaxton, Medley, Alberta
257,900 Ron Rhead, Willowdale, Ontario
221,350 John Cole, King City, Ontario
106,500 Jimmy Oliver, Hants City, NS
36,050 Darren Niranyan, Oswego, NY
PLANET RAIDERS *(Aardvark)*
16,770,300 ★Michael Moruzi, Sudbury, Ont.
3,547,800 Philip Morrissey, Gilbon, NY
2,010,900 Bill Messerick, S. St. Paul, MN
POLARIS *(Radio Shack)*
256,018 ★Michael Popovich, Sr., Nashua, NH
218,450 Allen Roth, Dayton, TX
212,746 Hwan Joo, Weston, Ontario
170,100 Steve Johnson, Santa Ana, CA
151,154 Brian Austin, Rotterdam, NY
57,338 Johnny Fritsch, Whitehall, PA
53,053 Paschal Wilson, Kentwood, LA
POLTERGEIST *(Radio Shack)*
6,455 ★Rich Van Manen, Grand Rapids, MI
4,970 Tim Warr, Bellingham, WA
4,950 Mark Dowling, San Bruno, CA
4,865 John Osborne, Kincardine, Ontario
4,860 Lori Raskob, Esalon, CA
4,665 Brad Gaucher, Hinton, Alberta
4,555 Bryan Jenner, Caigary, Alberta,
4,425 Sheri Munitz, Bellerose, NY
POPCORN *(Radio Shack)*
560,900 ★Vince Lok, Mississauga, Ontario
168,680 Steve Johnson, Santa Ana, CA
136,530 Scott Sehlhorst, Columbia, SC
110,570 Cameron Amick, Reisterstown, MD
96,470 Mike Wells, Pittsburgh, PA
31,220 Johnny Fritsch, Whitehall, PA

continued

MORE... RAINBOW SCOREBOARD

PROJECT NEBULA

650	★Joyce Isbell, Toccoa, GA
430	●Dale Westmoreland, Lannon, WI

PROTECTORS *(Tom Mix)*

594,610	★Roland Hendel, Mississauga, Ontario
358,514	Cameron Amick, Reisterstown, MD
275,810	Julian Bond, Berkeley, CA
272,000	Douglas Hug, Roseville, CA
217,000	Ian Waters, North Hero, VT

PYRAMID *(Radio Shack)*

200	★Greg Burke, Kenora, Ontario
180	Dan Burner, Fowler, FL
180	W. Knight, Mt. Hermon, CA
180	Lee Perkins, Norfolk, VA
165	●Dale Westmoreland, Lannon, WI
150	Michael Rosenberg, Prestonsburg, KY

QUEST *(Aardvark)*

2,200,000	★B.J. Bardy, Mt. Lebanon, PA
1,000,000	Nigel Wakelin, Mt. Lebanon, PA

RAIL RUNNER *(Computerware)*

53,520	★Jim Baker, Florissant, MO
53,400	Ed Bottini, St. Louis, MO
20,910	Nigel Wakelin, Mt. Lebanon, PA
19,400	Chris Sweet, Harvard, MA
17,325	Lenny Munitz, Bellerose, NY

ROBOT BATTLE *(Spectral Associates)*

21,000	★Bobby Bruce, Springfield, MO

ROBOTTACK *(Intracolor)*

2,216,950	★Randy Hankins, Tabor, IA
2,133,050	Donut, Tabor, IA
1,512,200	●Robert Kiser, Monticello, MS
1,424,300	John Osborne, Kincardine, Ont.
1,219,810	Steve Skrzyniarz, Tacoma, WA

SANDS OF EGYPT *(Radio Shack)*

121	★Grant Gillot, Calgary, Alberta
88	Mike Rausch, Denver, CO

SCARFMAN *(Cornsoft)*

495,440	★Woody Farmer, Alberta, Canada
371,540	Stanley Sneed, Erwin, TN
121,600	M. A. Brickles, Allen Park, MI

SEA DRAGON *(Adventure International)*

75,750	★Steve Schweitzer, Sewell, NJ
60,430	●Steve Skrzyniarz, Tacoma, WA
27,500	Wes Hill, Vashon, WA
23,750	Stephen Harden, Birmingham, AL

SHAFT *(Prickly-Pear Software)*

18,150	★Loren Seng, Tuscon, AZ
17,160	Julian Bond, Berkely, CA

SHARK TREASURE *(Computerware)*

172,000	★Aaron Peele, Benington, VT
150,000	Lori Raskob, Esalon, CA
126,000	Curtis Boyle, Saskatoon, Saskatchewan
72,000	Marc Hassler

SHOOTING GALLERY *(Radio Shack)*

52,010	★Vernell Paterson, Radcliff, KY
44,870	●Mark Nichols, Birsay, Saskatchewan
37,200	Chris Kulawy, St. Johnsville, NY
37,080	Gary Long, Peru, NY

SKIING *(Radio Shack)*

31.52	★Andy Truesdale, Ferguson, MO
35.89	Peter Johnson, Chino, CA
40.10	Fred Herrmann, Flemington, NJ
49.43	John Scanlan, Prairie Village, KS
1:12.02	Tim Brown, Clio, MI

SKY DEFENSE *(Quasar Animations)*

9,700	★Vince Lok, Mississauga, Ontario
6,700	Mike Anheluk, Fall Creek, OR
6,120	Steve Skrzyniarz, Tacoma, WA
5,200	Cameron Amick, Reisterstown, MD

SNAIL'S REVENGE *(the Rainbow)*

11,380	★Varunee Turner, Kamloops, B.C.
4,800	Bill Partridge, Clinton, CT
970	Michael Rosenberg, Prestonsburg, KY
840	Roanna Haggith, Nanaimo, B.C.
510	●Matt Luck, McLean, VA

SOLO POKER *(Radio Shack)*

830	★Aldona Rastenis, Euclid, OH
830	★Fran Tucher, Albilene, TX
670	Granville Bonyata, Tallahassee, FL
640	Mary J. Herring, Bloomington, IL
640	Stephen Jenkick, Pittsburgh, PA

SOLO POOL *(Tom Mix)*

110	★Bill Steelman, Edmonds, WA
103	John Fraysse, Dahlren, VA
83	Sarah Wakelin, Mt. Lebanon, PA
83	M.A. Brickles, Allen Park, MI

SPACE ACE *(Spectral Associates)*

983	★Matt McMann, New Boston, MI

SPACE AMBUSH *(Computerware)*

403,350	★Jimmy Chan, Kincardine, Ontario
124,460	John Osborne, Kincardine, Ontario

SPACE ASSAULT *(Radio Shack)*

1,632,450	★Walter Brokx, Granisle, BC
358,660	Mike Snelgrove, Oshawa, Ontario
238,580	John Cole, King City, Ontario
224,130	Derrick Kardos, Colonia, NJ
221,130	Steve Johnson,Santa Ana, CA

SPACE INVADERS *(Spectral Associates)*

1,496,030	★Jimmy Chan, Kincardine, Ontario
62,300	Peter Niessen, Carlisle, MA
54,980	Susan Brink, Portage, MI
53,930	Linda Delisle, N. Adams, MA
29,560	Greg Brink, Portage, MI

SPACE RACE *(Spectral Associates)*

83,750	★John Osborne, Kincardine, Ontario
62,875	Shane Deike, Bolme, TX
59,825	Jim Baker, Florissant, MO
58,100	John Cole, King City, Ontario
55,625	Steve Skrzyniarz, Tacoma, WA

SPACE RAIDERS *(Mark Data)*

112,100	★Jimmy Chan, Kincardine, Ontario

SPACE SENTRY *(Spectral Associates)*

41,129	★Steve Skrzyniarz, Tacoma, WA
2,625	Cameron Amick, Reisterstown, MD

SPACE SHUTTLE *(Tom Mix)*

595	★Steve Schweitzer, Sewell, NJ
575	Fred Weissman, Brookline, MA
571	Ted McDonald, Summerville, SC
566	Tim Smith, San Rafael, CA
562	Kenton Fifield, Ft. Frances, Ontario

SPACE WAR *(Spectral Associates)*

400,190	★Mark Felps, Bedford, TX
116,000	Peter Niessen, Carlisle, MA
52,380	Jim Baker, Florissant, MO
16,500	Chris Leek, Martintown, Ontario
11,540	David Iverson, Dorval, Quebec

STARBASE ATTACK *(IMB)*

328,000	★Paul Morris, Richland, VA
62,551	Chris Coyle, Selden, NY
60,602	Beth Walker, Gloucester Pt., VA
35,659	Dennis Teague, Noblesville, IN
24,668	J.W. Pank, Noblesville, IN

STARBLASTER *(Micro Works)*

408,245	★Mark Dowling, San Bruno, CA
325,790	Mike Anheluk, Fall Creek, OR
126,135	Mike Hall, Hartland, WI
113,450	Darren Noranyan, Oswego, NY
80,001	Alan Lewis, Ridgefield, CT

STARFIRE *(Intellectronics)*

10,000,000	★Roland Hendel, Ontario
3,444,500	John DeMuth, Prairie de Chien, WI
2,102,450	Dean Bouchard, Kingston, N.S.
1,420,000	Steve Schweitzer, Sewell, NJ
1,000,050	Chuck Ladig, Suisun City, CA
915,500	Bryan Jenner, Caigary, Alberta

STARSHIP CHAMELEON *(Computerware)*

861,200	★Greg Lesher, North Chili, NY
82,200	Chris Sweet, Harvard, MA
79,250	Vince Lok, Mississauga, Ontario
75,500	Ron Pinson, Guelph, Ontario
72,600	Jim Baker, Florissant, MO

STORM *(Computerware)*

840,010	★Roland Hendel, Mississauga, Ontario
723,335	Chris Sweet, Harvard, MA
472,320	John Jaworski, Nashua, NY
380,000	Cameron Amick, Reisterstown, MD
312,000	Dave Lubnow, Sussex, NJ
63,415	Rip Loomis, Long Beach, MS

STORM ARROWS *(Spectral Associates)*

94,000	★Steven Ohsie, Houston, TX
22,200	Cameron Amick, Reisterstown, MD

TEEEOFFF *(Prickly-Pear Software)*

32	★Mark Wright, Tipton, MI

TRAPFALL *(Tom Mix)*

113,408	★Rich Trawick, N. Adams, MI
104,456	Robert Cattral, Ottawa, Ontario
104,368	John Osborne, Kincardine, Ontario
98,588	Dan Burch, Louisville, KY
96,800	Bruce March, Barrie, Ontario
80,000	William Delanpree, Millbrae, CA
9,518	Joyce Isbell, Toccoa, GA

VENTURER *(Aardvark)*

4,126,200	★Greg Scott, Orlando, FL
2,291,100	Mike Sitzer, Roslyn, NY
2,657,350	Brian Panepinto, Spencerport, NY
2,152,150	Greg Scott, Orlando, FL
1,769,400	Todd Hauschildt, Red Wing, MN

WACKYFOOD *(Arcade Animation)*

130,100	★Lenny Munitz, Bellerose, NY
110,300	Bette Munitz, Bellerose, NY
99,900	Sheri Munitz, Bellerose, NY
42,800	Saul Munitz, Bellerose, NY

WHIRLYBIRD RUN *(Spectral Associates)*

516,450	★Dan Shargel, Arroyo Grande, CA
103,900	Dann Fabian, Crestview, FL
98,400	Dave Lubnow, Sussex, NJ
48,000	Todd Brannam, Charleston Hts., SC
38,600	Darren Noranyan, Oswego, NY
17,600	David Shelby, St. Albane, WV

WILDCATTING *(Radio Shack)*

48,682	★David Rodgers, Carbondale, IL
42,782	Michael Rosenberg, Prestonsburg, KY
30,555	Gary Jones, Dale, TX
29,854	Matt Buist, Bangor, PA
29,137	Andre Wagner, Bangor, PA
28,842	Kay Jinkich, Pittsburgh, PA

ZAKSUND *(Elite Software)*

1,128,050	★Richard Minton, West Frankfort, IL
1,008,100	Andy Mickelson, Granville, OH
950,500	Michael Rothman, Solon, OH
910,000	Steve Schweitzer, Sewell, NJ
876,200	John Osborne, Kincardine, Ontario
53,700	Christopher Lee, Canton, OH

ZAPEM *(Chromasette)*

12,950	★Michael McCafferty, Idaho Falls, ID

ZAXXON *(Datasoft)*

2,000,000	★Roland Hendel, Mississauga, Ontario
1,510,000	James Quadarella, Brooklyn, NY
401,900	Mike Hughey, King George, VA
370,400	Chris Coyle, Selden, NY
235,200	Rich McGervey, Morgantown, WV
130,800	Brad Gaucher, Hinton, Alberta
122,900	Roger Buzard, Lima, OH
94,600	Jeff Weeks, Hinton, Alberta
92,700	Randell Walker, Dunbar, WV
64,200	Derrek Davis, Alexandria, VA
61,700	Jim Partridge, Clinton, CT

ZERO G *(Chromasette)*

19,735	Michael Foley, N. Quincy, MA

MC-10 Memory Map

by
H.
Allen
Curtis

This comprehensive mapping of MC-10's memory was inspired by Bob Russell's "Color Computer Memory Map" (July, August, September and December issues of *the Rainbow*). Russell's memory map not only was an inspiration, but was also heavily relied on as a guide in the compilation of the MC-10 memory references.

There are still many important unmapped locations awaiting your discovery, especially those associated with input/output. I would be most appreciative of your informing me of your discoveries and possible corrections so that the MC-10 memory can expand and improve.

The map covers two areas of memory: RAM reserved for BASIC's use, and the ROM. The map has three headings: *Hex*, *Decimal* and *Description*. *Hex* specifies the mapped address or addresses in hexadecimal notation. *Decimal* refers to the same addresses, but in decimal. Under the *Description* heading, the function, operation or use of the specified address is described. All addresses and contents referred to under *Description* are specified in hexadecimal.

(H. Allen Curtis, who earned degrees from the College of William and Mary, M.I.T., and Harvard, recently won an award for meritorious service from the IEEE Computer Society. He has had published a college reference book in the computer science field, as well as many papers and articles.)

HEX	DECIMAL	DESCRIPTION
0082	130	General counter
0084	132	String flag
0093-0094	147-148	Address of start of BASIC program
0095-0096	149-150	Address of start of variables storage; address-1 is end of BASIC program
0097-0098	151-152	Address of start of arrays storage
0099-009A	153-154	Address of beginning of free memory used in NEW command
009B-009C	155-156	Address of start of string pool and BASIC stack
009D-009E	157-158	Address of BASIC limit
009F	159	Pointer to string in string pool
00A1-00A2	161-162	Highest available RAM address
00AD-00AE	173-174	Pointer to values in DATA statements
00BB-00C2	187-194	Scratch area used in garbage collection routine and move memory block routine Data for block move: 00BB-00BC high end destination address 00BD-00BE high end source address 00BF-00C0 low end destination address 00C1-00C2 low end source address

HEX	DECIMAL	DESCRIPTION
00C9-00CE	201-206	Floating Point Accumulator 1 (FPAC1)
00C9	201	Exponent
00CA-00CD	202-205	Mantissa
00CE	206	Sign
00D0	208	String variable length
00D6-00DB	214-219	Floating Point Accumulator 2 (FPAC2)
00D6	214	Exponent
00D7-00DA	215-218	Mantissa
00DB	219	Sign
00DC	220	Sign comparison
00DD	221	Extended precision byte
00E8	232	Device number -2 = Printer -1 = Cassette 0 = Screen
00EA	234	Warm start flag 55 = If address in 4221-4222 points to 01 (NOP), then control is transferred to address in 4221-4222 Not 55 = Do warm start
00EB-00F8	235-248	Get next character routine: JSR 00EB will get next byte. JSR 00F3 will get current byte.
00F4-00F5	244-245	Character pointer
4000-41FF	16384-16895	Text screen memory
4200-4214	16896-16916	Interrupt Vectors: each initialized to 3B0000
4200-4202	16896-16898	Called from FFF0
4203-4205	16899-16901	Called from FFF2
4206-4208	16902-16904	Called from FFF4
4209-420B	16M05-16907	FIRQ-Fast Interrupt Request called from FFF6
420C-420E	16908-16910	IRQ-Interrupt Request called from FFF8
420F-4211	16911-16913	SWI-Software Interrupt called from FFFA. Execution of 3F (SWI) will stack registers and jump here
4212-4214	16914-16916	NMI-Non-Masked Interrupt called from FFFC
4215-4217	16917-16919	Jump to BASIC's USR routine
4216-4217	16918-16919	USR address to be specified in user's program

HEX	DECIMAL	DESCRIPTION
421C	16924	Keyboard alpha lock (upper or lower case selection) 0 = lower case (not locked) 1 = upper case (locked)
421D-421E	16925-16926	Keyboard delay constant
421F-4220	16927-16928	EXEC address and transfer address after CLOADM
4221-4222	16929-16930	Warm start vector address At power up it contains F7C3
4223-422A	16931-16938	Printer variables
4223-4224	16931-16932	RS-232 baud rate (0076) for 600 baud
4225-4226	16933-16934	RS-232 line return delay in secs (0001)
4227	16935	RS-232 comma field width (10)
4228	16936	RS-232 last comma field width (70)
4229	16937	RS-232 line printer width (84) 132 char/line
422A	16938	RS-232 print head position
422C	16940	Full wave threshold (15)
422D	16941	Noise rejection (1A)
422E	16942	Half wave threshold (0B)
4231-4238	16945-16952	Keyboard rollover table

		DF	EF	F7	FB	FD	FE
4231	16945	8	0	X	P	H	@
4232	16946	9	1	Y	Q	I	A
4233	16947	:	2	Z	R	J	B
4234	16948	;	3		S	K	C
4235	16949	,	4		T	L	D
4236	16950	-	5		U	M	E
4237	16951	.	6	ENTER	V	N	F
4238	16952	/	7	SPACE	W	O	G

Using SHIFT or CONTROL does not change value of key. Each address has value FF if none of its keys are pressed. Striking keys simultaneously gives ANDed values E.g.: Strike 2 and R then contents of 4233 is EF AND FB = EB

HEX	DECIMAL	DESCRIPTION
4257-425E	16983-16990	Cassette file-name
425F-426D	16991-17005	File header
425F-4266	16991-16998	File-name
4267	16999	File type: 0 = BASIC 2 = machine-language 4 = arrays

HEX	DECIMAL	DESCRIPTION
426A-426B	17002-17003	Entry address of machine-language program
426C-426D	17004-17005	First address of machine-language program
4275	17013	Block type 0 = file header 1 = data FF = end of file
4276	17014	Number of bytes in block (01 to FF)
4278-4279	17016-17017	Buffer address; program end address+1 of machine-language program
427A	17018	Checksum
427B	17019	Cassette read error 0 = no errors 1 = checksum error 2 = memory error
427C	17020	General counter
427D	17021	Pulse width count
427E	17022	Rise/fall flag (0=rise)
4280-4281	17024-17025	Address of current cursor position
4285-42AE	17029-17070	Hooks to RAM from ROM BASIC initializes each hook to 393939
4285-4287	17029-17031	Called from F865
4288-428A	17032-17034	Called from F9C6
428B-428D	17035-17037	Called from FA7B
428E-4290	17038-17040	Called from E3DE
4291-4293	17041-17043	Called from FAA4
4294-4296	17044-17046	Called from E9E5
4297-4299	17047-17049	Called from E238
429A-429C	17050-17052	Called from E23B
429D-429F	17053-17055	Called from F359
42A0-42A2	17056-17058	Called from E546
42A3-42A5	17059-17061	Called from E3A2
42A6-42A8	17062-17064	Called from E49F
42A9-42AB	17065-17067	Called from F883
42AC-42AE	17068-17070	Called from F8FB
42B2-4331	17074-17201	INPUT buffer area
4346	17222	Usual start of BASIC program

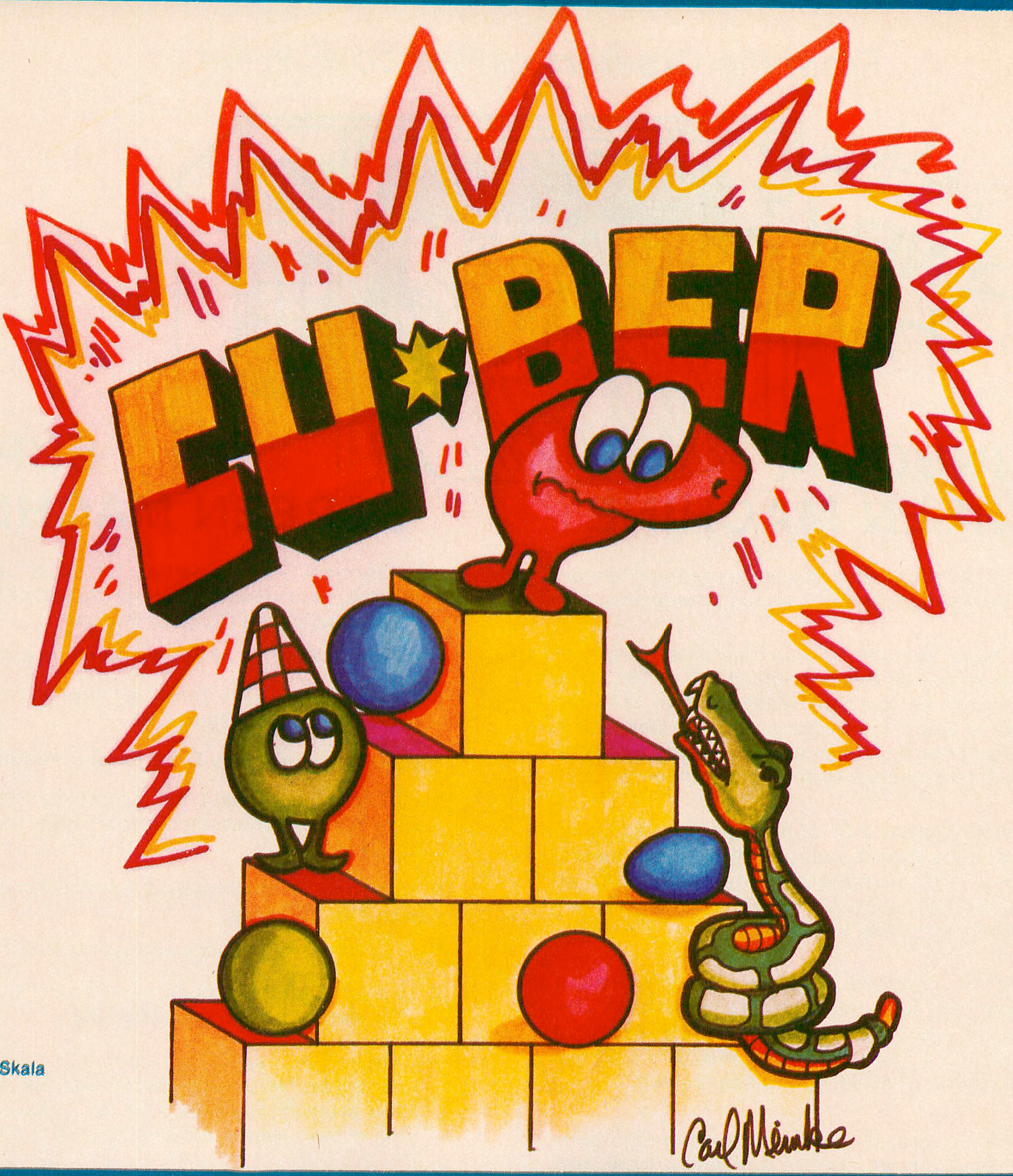
HEX	DECIMAL	DESCRIPTION	
E000-E02F	57344-57391	Table of pointers to subroutine entry addresses associated with BASIC Key Word Table found at E0EE-E146	
		Contents	For Function
E000-E001	57344-57345	F2BA	SGN
E002-E003	57346-57347	F335	INT
E004-E005	57348-57349	F2D5	ABS
E006-E007	57350-57351	4215	USR
E008-E009	57352-57353	F62A	RND
E00A-E00B	57354-57355	F54D	SQR
E00C-E00D	57356-57357	F0B9	LOG
E00E-E00F	57358-57359	F5C9	EXP
E010-E011	57360-57361	F68C	SIN
E012-E013	57362-57363	F686	COS
E014-E015	57364-57365	F6D2	TAN
E016-E017	57366-57368	EF5F	PEEK
E018-E019	57368-57369	EE82	LEN
E01A-E01B	57370-57371	ECED	STR$
E01C-E01D	57372-57373	EF1C	VAL
E01E-E01F	57374-57375	EEA2	ASC
E020-E021	57376-57377	EE8E	CHR$
E022-E023	57378-57379	EEAD	LEFT$
E024-E025	57380-57381	EEC8	RIGHT$
E026-E027	57382-57383	EECF	MID$
E028-E029	57384-57385	FB9C	POINT
E02A-E02B	57386-57387	FC11	VARPTR
E02C-E02D	57388-57389	FBED	INKEY$
E02E-E02F	57390-57391	ECDB	MEM
E045-E189	57413-57737	BASIC Command key word - token table with ASCII characters	
		Contains string	converted to token
E045-E047	57413-57415	FOR	80
E048-E04B	57416-57419	GOTO	81
E04C-E050	57420-57424	GOSUB	82
E051-E053	57425-57427	REM	83
E054-E055	57428-57429	IF	84
E056-E059	57430-57433	DATA	85
E05A-E05E	57434-57438	PRINT	86
E05F-E060	57439-57440	ON	87
E061-E065	57441-57445	INPUT	88
E066-E068	57446-57448	END	89
E069-E06C	57449-57452	NEXT	8A
E06D-E06F	57453-57455	DIM	8B
E070-E073	57456-57459	READ	8C
E074-E076	57460-57462	LET	8D
E077-E079	57463-57465	RUN	8E
E07A-E080	57466-57472	RESTORE	8F
E081-E086	57473-57478	RETURN	90
E087-E08A	57479-57482	STOP	91
E08B-E08E	57483-57486	POKE	92

HEX	DECIMAL	DESCRIPTION	
		Contains string	converted to token
E08F-E092	57487-57490	CONT	93
E093-E096	57491-57494	LIST	94
E097-E09B	57495-57499	CLEAR	95
E09C-E09E	57500-57502	NEW	96
E09F-E0A3	57503-57507	CLOAD	97
E0A4-E0A8	57508-57512	CSAVE	98
E0A9-E0AD	57513-57517	LLIST	99
E0AE-E0B3	57518-57523	LPRINT	9A
E0B4-E0B6	57524-57526	SET	9B
E0B7-E0BB	57527-57531	RESET	9C
E0BC-E0BE	57532-57534	CLS	9D
E0BF-E0C3	57535-57539	SOUND	9E
E0C4-E0C7	57540-57543	EXEC	9F
E0C8-E0CC	57544-57548	SKIPF	A0
E0CD-E0D0	57549-57552	TAB(	A1
E0D1-E0D2	57553-57554	TO	A2
E0D3-E0D6	57555-57558	THEN	A3
E0D7-E0D9	57559-57561	NOT	A4
E0DA-E0DD	57562-57565	STEP	A5
E0DE-E0E0	57566-57568	OFF	A6
E0E1	57569	+	A7
E0E2	57570	-	A8
E0E3	57571	*	A9
E0E4	57572	/	AA
E0E5	57573	^	AB
E0E6-E0E8	57574-57576	AND	AC
E0E9-E0EA	57577-57578	OR	AD
E0EB	57579	>	AE
E0EC	57580	=	AF
E0ED	57581	<	B0
E0EE-E0F0	57582-57584	SGN	B1
E0F1-E0F3	57585-57587	INT	B2
E0F4-E0F6	57588-57590	ABS	B3
E0F7-E0F9	57591-57593	USR	B4
E0FA-E0FC	57594-57596	RND	B5
E0FD-E0FF	57597-57599	SQR	B6
E100-E102	57600-57602	LOG	B7
E103-E105	57603-57605	EXP	B8
E106-E108	57606-57608	SIN	B9
E109-E10B	57609-57611	COS	BA
E10C-E10E	57612-57614	TAN	BB
E10F-E112	57615-57618	PEEK	BC
E113-E115	57619-57621	LEN	BD
E116-E119	57622-57625	STR$	BE
E11A-E11C	57626-57628	VAL	BF
E11D-E11F	57629-57631	ASC	C0
E120-E123	57632-57635	CHR$	C1
E124-E128	57636-57640	LEFT$	C2
E129-E12E	57641-57646	RIGHT$	C3
E12F-E132	57647-57650	MID$	C4
E133-E137	57651-57655	POINT	C5
		Contains string	converted to token
E138-E13D	57656-57661	VARPTR	C6
E13E-E143	57662-57667	INKEY$	C7
E144-E146	57668-57670	MEM	C8
E148-E189	57672-57737	Table of pointers to subroutine entry addresses associated with BASIC key word table found at E045-E0CC	
		Contents	For command
E148-E149	57672-57673	E4C4	FOR
E14A-E14B	57674-57675	E61A	GOTO
E14C-E14D	57676-57677	E604	GOSUB
E14E-E14F	57678-57679	E685	REM
E150-E151	57680-57681	E672	IF
E152-E153	57682-57683	E651	DATA
E154-E155	57684-57685	E71F	PRINT
E156-E157	57686-57687	E692	ON
E158-E159	57688-57689	E7DE	INPUT
E15A-E15B	57690-57691	E57F	END
E15C-E15D	57692-57693	E8BB	NEXT
E15E-E15F	57694-57695	EB12	DIM
E160-E161	57696-57697	E80E	READ
E162-E163	57698-57699	E6D3	LET
E164-E165	57700-57701	E5FA	RUN
E166-E167	57702-57703	E560	RESTORE
E168-E169	57704-57705	E631	RETURN
E16A-E16B	57706-57707	E57E	STOP
E16C-E16D	57708-57709	EF66	POKE
E16E-E16F	57710-57711	E5A6	CONT
E170-E171	57712-57713	E40D	LIST
E172-E173	57714-57715	E5B8	CLEAR
E174-E175	57716-57717	E3CD	NEW
E176-E177	57718-57719	FD5C	CLOAD
E178-E179	57720-57721	FC3B	CSAVE
E17A-E17B	57722-57723	E40B	LLIST
E17C-E17D	57724-57725	E71C	LPRINT
E17E-E17F	57726-57727	FB25	SET
E180-E181	57728-57729	FB55	RESET
E182-E183	57730-57731	FBBF	CLS
E184-E185	57732-57733	FFA5	SOUND
E186-E187	57734-57735	FC04	EXEC
E188-E189	57736-57737	FE2F	SKIPF

E18A-E1AF	57738-57775	Table of error messages Error messages
E18A-E18B	57738-57739	NF
E18C-E18D	57740-57741	SN
E18E-E18F	57742-57743	RG
E190-E191	57744-57745	OD
E192-E193	57746-57747	FC
E194-E195	57748-57749	OV
E196-E197	57750-57751	OM
E198-E199	57752-57753	UL
E19A-E19B	57754-57755	BS
E19C-E19D	57756-57757	DD
E19E-E19F	57758-57759	/0
E1A0-E1A1	57760-57761	ID
E1A2-E1A3	57762-57763	TM
E1A4-E1A5	57764-57765	OS
E1A6-E1A7	57766-57767	LS
E1A8-E1A9	57768-57769	ST
E1AA-E1AB	57770-57771	CN
E1AC-E1AD	57772-57773	IO
E1AE-E1AF	57774-57775	FM
E200	57856	Entry to routine to move block of memory: 00BB-00BC holds destination top address 00BD-00BE holds source top address 00BF-00C0 holds destination bottom address 00C1-00C2 holds source bottom address
E238	57912	Entry address to routine for error processing. Register B holds error type number on entry. 00 for NF 02 for SN 04 for RG 06 for OD 08 for FC 0A for OV 0C for OM 0E for UL 10 for BS 12 for DD 14 for /0 16 for ID 18 for TM 1A for OS 1C for LS 1E for ST 20 for CN 22 for IO 24 for FM
E271	57969	Entry to BASIC command level This is the idle loop: print "OK"; tokenize a line and JMP E53D

HEX	DECIMAL	DESCRIPTION
E3CD	58317	Entry to NEW routine
E40B	58379	Entry to LLIST routine
E40D	58381	Entry to LIST routine
E4C4	58564	Entry to FOR routine
E560	58720	Entry to RESTORE routine
E57E	58750	Entry to STOP routine
E57F	58751	Entry to END routine
E5A6	58790	Entry to CONT routine
E5B8	58808	Entry to CLEAR routine
E5FA	58874	Entry to RUN routine
E604	58884	Entry to GOSUB routine
E61A	58906	Entry to GOTO routine
E631	58929	Entry to RETURN routine
E651	58961	Entry to DATA routine
E672	58994	Entry to IF routine
E685	59013	Entry to REM routine
E692	59026	Entry to ON routine
E6D5	59093	Entry to LET routine
E71C	59164	Entry to LPRINT routine
E71F	59167	Entry to PRINT routine
E7A8	59304	Entry to routine to print message on screen: X points to start of message address-1. Address following message must contain 00
E7DE	59358	Entry to INPUT routine
E80E	59406	Entry to READ routine
E8BB	59579	Entry to NEXT routine
EB12	60178	Entry to DIM routine
EBCA	60362	Entry to routine that converts a floating point number to a 16 bit 2's complement integer in D
ECDB	60635	Entry to MEM routine
ECE3	60643	Entry to routine that transforms a 2's complement integer in D to a floating point number in FPAC1. Also, if routine is used to exit from USR initiated routine, it passes the integer to BASIC.
ECED	60	Entry to STR$ routine
ED5F-EE05	60767-60933	Garbage collection routines Entries to:
ED5F	60767	Allocate string in storage buffer
ED85	60805	Collect garbage
EDCD	60877	Process a descriptor
EDE7	60903	Compact a string

HEX	DECIMAL	DESCRIPTION
EE82	61058	Entry to LEN routine
EE8E	61070	Entry to CHR$ routine
EEA2	61090	Entry to ASC routine
EEAD	61101	Entry to LEFT$ routine
EEC8	61128	Entry to RIGHT$ routine
EECF	61135	Entry to MID$ routine
EF1C	61212	Entry to VAL routine
EF5F	61279	Entry to PEEK routine
EF66	61286	Entry to POKE routine
EF72	61298	Entry to floating point subtract routine: FPAC1=[X]-FPAC1
EF7D	61309	Entry to floating point add routine: FPAC1=[X]+FPAC1
F0B9	61625	Entry to LOG routine
F0EF	61679	Entry to floating point multiply routine: FPAC1=[X]*FPAC1
F1C6	61894	Entry to floating point divide routine: FPAC1=[X]/FPAC1
F2BA	62138	Entry to SGN routine
F2D5	62165	Entry to ABS routine
F335	62261	Entry to INT routine
F419	62419	Entry to routine that displays decimal value of number in D
F54D	62797	Entry to SQR routine
F5C9	62921	Entry to EXP routine
F62A	63018	Entry to RND routine
F686	63110	Entry to COS routine
F68C	63116	Entry to SIN routine
F6D2	63186	Entry to TAN routine
F72E	63278	Entry to routine that performs reset when reset button is pressed
F7B2	63410	Entry to routine that transfers a block: 00BF-00C0 holds bottom destination address B register holds number of bytes to be transferred X points to bottom source address
F7C3	63427	Entry to routine for warm restart (pointers are not reinitialized)
F865	63589	Entry to routine that displays cursor and waits for input character from keyboard and puts character in register A
F883	63619	Entry to routine that checks for character at keyboard: If Z=0 then character is in register A
F9C6	63942	Entry to routine that outputs a character to device specified by the contents of 00E8. Contents of registers are preserved.
FA10	64016	Entry to rnutine for half bit time delay.
FAA4	64164	Entry to line input routine
FB25	64293	Entry to SET routine
FB55	64341	Entry to RESET routine
FB9C	64412	Entry to POINT routine
FBBF	64447	Entry to CLS routine
FBD4	64468	Entry to routine that clears screen to blanks and homes cursor
FBED	64493	Entry to INKEY$ routine
FC04	64516	Entry to EXEC routine
FC11	64529	Entry to VARPTR routine
FC3B	64571	Entry to CSAVE routine
FCB1	64689	Entry to routine to write leader, gap, and 55's
FCC0	64704	Entry to routine that writes block: Tape should be up to speed and leader of 55's already written in 1st block; 4278-4279 contains buffer address; 4275 contains block type; 4276 contains the number of bytes in block
FD5C	64860	Entry to CLOAD routine
FE2F	65071	Entry to SKIPF routine
FEBD	65	Entry to routine that reads a block from tape; must be in sync; 4275 contains block type; 4276 holds block length.
FF4E	65358	Entry to routine to synchronize data (read gap and leader of 55's)
FFA5	65445	Entry to SOUND routine



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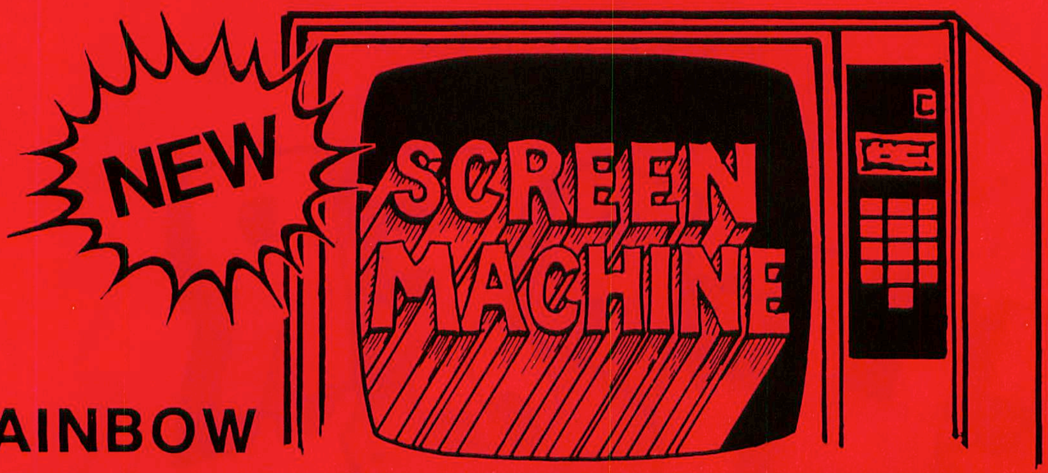

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Corrections

In Bob Tyson's contest winner, *Election '84* (November 1983), you will encounter a BS Error in Line 42 when in the two-player mode. To solve the problem, Bob says to delete Line 42.

Colin J. Stearman reports that a minor bug has emerged in his *QSORT* program (August 1983). It causes the computer to lock up if both I(0) and I(1) are set to zero. These are the parameters which establish the subscript range to sort upon. Setting these parameters to zero doesn't make much sense as it tells *QSORT* to sort an array consisting of one element. However, it could happen if these values were set by the program perhaps. To patch the bug, do the following:

1. PCLEAR 4(:FILES2,256 if you have disk)
2. (C)LOADM"QSORT" at its normal $E00 starting point.
3. POKE&HF36,&HA3
4. POKE&HF37,&H8D
5. POKE&HF38,&HFE
6. POKE&HF39,&HC6
7. POKE&HF3A,&H12
8. POKE&HF3B,&H12
9. POKE&HF43,&H64
10. (C)SAVEM"QSORT",&HE00,&H145D,&HE4E

In *Rainbow* Technical Editor Dan Downard's article "Remote Operation Of The Color Computer" (November 1983), the Baud rate must be changed. You can do this by *POKEing* &H3F01, &HB8 before running the program.

Larry Konecky reports a bit of discord in "The CoCo Composer" (December 1983). Change Lines 680 and 685 and add Line 686, as follows:

```
680 IFT=1THENSAVEMT$,&H2A00,Q,&H200 ELSE 686
685 GOTO60
686 CSAVEM T$,&H2A00,Q,&H2C00:GOTO60
```

In the same article, the musical symbols for numeric values were omitted. Examples of length values are:

♪ =18 ♩ =36 𝅗𝅥 =72 𝅝 =144

If you found our directions for loading Tom Weber's four-part *WarGame* (November 1983) less than adequate, you aren't alone. Let's try again:

After all four parts of the program have been typed in and saved to tape, the simulation is ready to be played. To load and play, there are four steps.

1. *CLOADM "Part A1"*— When this part finishes loading, do not *EXEC* but rather:
2. *CLOAD* "Part 2"— When done loading, type *RUN* and wait for the war room scene to be drawn, which takes approximately one minute. Since this, along with the time it took to load Part 2 is considerable, after completing its picture, Part 2 should be saved to a separate tape as an ML file, which — in future sessions — can be used instead of Part 2 and loaded in with a *CLOADM* command (no *EXEC!*). The ML tape you create loads and is ready to go much faster than it took to load and run Part 2. If so desired, after you have *RUN* and saved Part 2 to tape, you can kill the original BASIC Part 2, since it no longer will be needed to set up the game.
3. *CLOAD* "Part 3" — This is the instruction program. This program will automatically load in the next one after you type *RUN* and press [ENTER].
4. When "Part 4" is in, you will see an "OK" prompt in the lower left corner of the screen. Type *RUN*, press [ENTER], and the war is on . . .

To start another game after you've finished one, *CLOADM* "WAR ROOM," which is the name of the ML tape which "Part 2" helped you create. Once loaded, assuming "Part 4" is still in memory, simply type *RUN* and hit [ENTER] to play again.

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RAINBOW Info

How To Read Rainbow

Please note that all the BASIC program listings you will find in *the Rainbow* are formatted for a 32-character screen — so they will show up just as they do on your CoCo screen. One easy way to check on the accuracy of your typing is to compare what character "goes under" what. If the characters match — and your line endings come out the same — you have a pretty good way of knowing that your typing is accurate.

We also have "key boxes" to show you the *minimum* system a program needs. But, *do* read the text before you start typing.

Finally, the little cassette symbol on listings indicates that program is available through our *Rainbow On Tape* service. An order form for this service is on the insert card bound in the magazine.

RAINBOW
CERTIFICATION
SEAL

The Rainbow Seal

The Rainbow Certification Seal is our way of helping you, the consumer. The purpose of the Seal is to certify to you that any product which carries the Seal has been physically seen by us and that it does, indeed, exist.

Manufacturers of products — hardware, software and firmware — are encouraged by us to submit their products to *the Rainbow* for certification. We ascertain that their products are, in actuality, what they purport to be and, upon such determination, award a Seal. This lets you know that we have seen the product and that it does, indeed, exist.

The Seal, however, is not a "guarantee of satisfaction." The certification process is different from the review process. You are encouraged to read our reviews to determine whether the product is right for your needs.

There is absolutely no relationship between advertising in *the Rainbow* and the certification process. Certification is open and available to any product pertaining to CoCo. A Seal will be awarded to *any* commercial product, regardless of whether the firm advertises or not.

We will appreciate knowing of instances of violation of Seal use.

Using Machine Language

Machine Language programs are one of the features of *the Rainbow*. There are a number of ways to "get" these programs into memory so that you can operate them.

The easiest way is by using an Editor-Assembler, a program you can purchase from a number of sources.

An editor-assembler allows you to enter mnemonics into your CoCo and then have the editor-assembler assemble them into specific instructions that are understood by the 6809 chip that controls your computer.

When you use an editor-assembler, all you have to do, essentially, is copy the relevant instructions from *the Rainbow's* listing into CoCo.

Another method of getting an assembly language listing into CoCo is called "hand assembly." As the name implies, you do the assembly by hand. This can *sometimes* cause problems when you have to set up an ORIGIN statement or an EQUATE. In short, you have to know something about assembly to hand assemble some programs.

Use the following program if you wish to hand assemble machine language listings:

```
10 CLEAR200,&H3F00:I=&H3F80
20 PRINT "ADDRESS:";HEX$(I);
30 INPUT "BYTE";B$
40 POKE I,VAL("&H"+B$)
50 I=I+1:GOTO 20
```

This program assumes you have a 16K CoCo. If you have 32K, change the &H3F00 in Line 10 to &H7F00.

What's A CoCo

CoCo is an affectionate name which was first given to the TRS-80 Color Computer by its many fans, users and owners. As such, it is almost a generic term for three computers, all of which are very much alike.

When we use the term CoCo, we refer to the TRS-80 Color Computer, the TDP System-100 Computer and the Dragon-32 Computer. It is easier than using the three "given" names throughout *the Rainbow*.

In most cases, when a specific computer is mentioned, the application is for that specific computer. However, since the TDP System-100 and TRS-80 Color are, for all purposes, the same computer in a different case, these terms are almost always interchangable.

The Rainbow Check

The small boxes which you see with programs in *the Rainbow* are our *RAINBOW CHECK* program, which is designed to help you type in programs accurately.

The check program will count the number of characters you type in. You can then compare the number the *RAINBOW CHECK* gives you to those printed in *the Rainbow*. On longer programs, some benchmark lines are given. When you reach the end of one of those lines with your typing, simply check to see if the numbers match.

To use the *RAINBOW CHECK*, type in the program, *CSAVE* it for future use, then type in the command *RUN* and press *ENTER*. Once the program has run, type *NEW* to remove it from that area into which you will be keying programs.

Now, whenever you press the down arrow, CoCo will give you the hexadecimal number of bytes in memory. This is to check against the numbers printed in *the Rainbow*. If your number is different, check the listing carefully to be sure you typed in the proper BASIC program code.

As the hexadecimal number appears in the upper-left corner of the monitor screen, you may want to clear the screen and press the spacebar five or six times to move the cursor out of the way for easy reading. The *RAINBOW CHECK* counts spaces, too, follow the spacing just as it appears in the magazine.

Here's the program:

```
 10 CLS:IF  PEEK(116)=127  THEN
X=32688 ELSE X=16304
 20 CLEAR 25,X-1
 30 IF PEEK(116)=127 THEN X=32688
ELSE X=16304
 40 FOR Z=X TO X+77
 50 READ Y:W=W+Y:PRINT Z,Y;W
 60 POKE Z,Y:NEXT
 70 IF W=5718 THEN 80 ELSE PRINT
"DATA ERROR":STOP
 80 EXEC X:END
 90 DATA 182, 1, 106, 167, 141, 0, 68
 100 DATA 134, 126, 183, 1, 106, 190
 110 DATA 1, 107, 175, 141, 0, 57, 48
 120 DATA 141, 0, 4, 191, 1, 107, 57
 130 DATA 129, 10, 38, 44, 52, 22, 220
 140 DATA 27, 147, 25, 142, 4, 0, 141
 150 DATA 6, 31, 152, 141, 2, 32, 25
 160 DATA 52, 2, 68, 68, 68, 68
 170 DATA 141, 4, 53, 2, 132
 180 DATA 15, 129, 9, 46, 4, 139, 112
 190 DATA 32, 2, 139, 55, 167, 128, 57
 200 DATA 53,22,126,0,0
```

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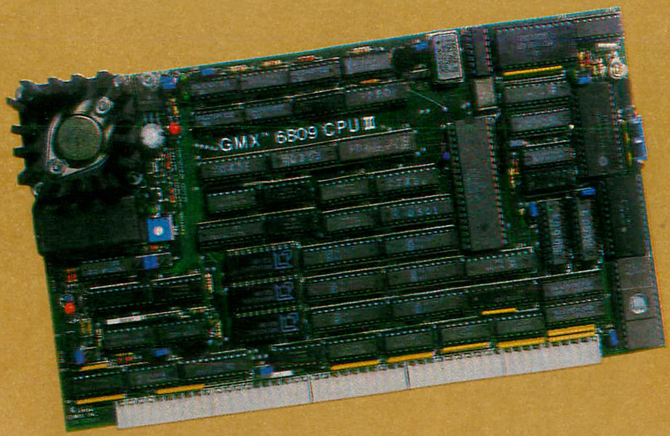

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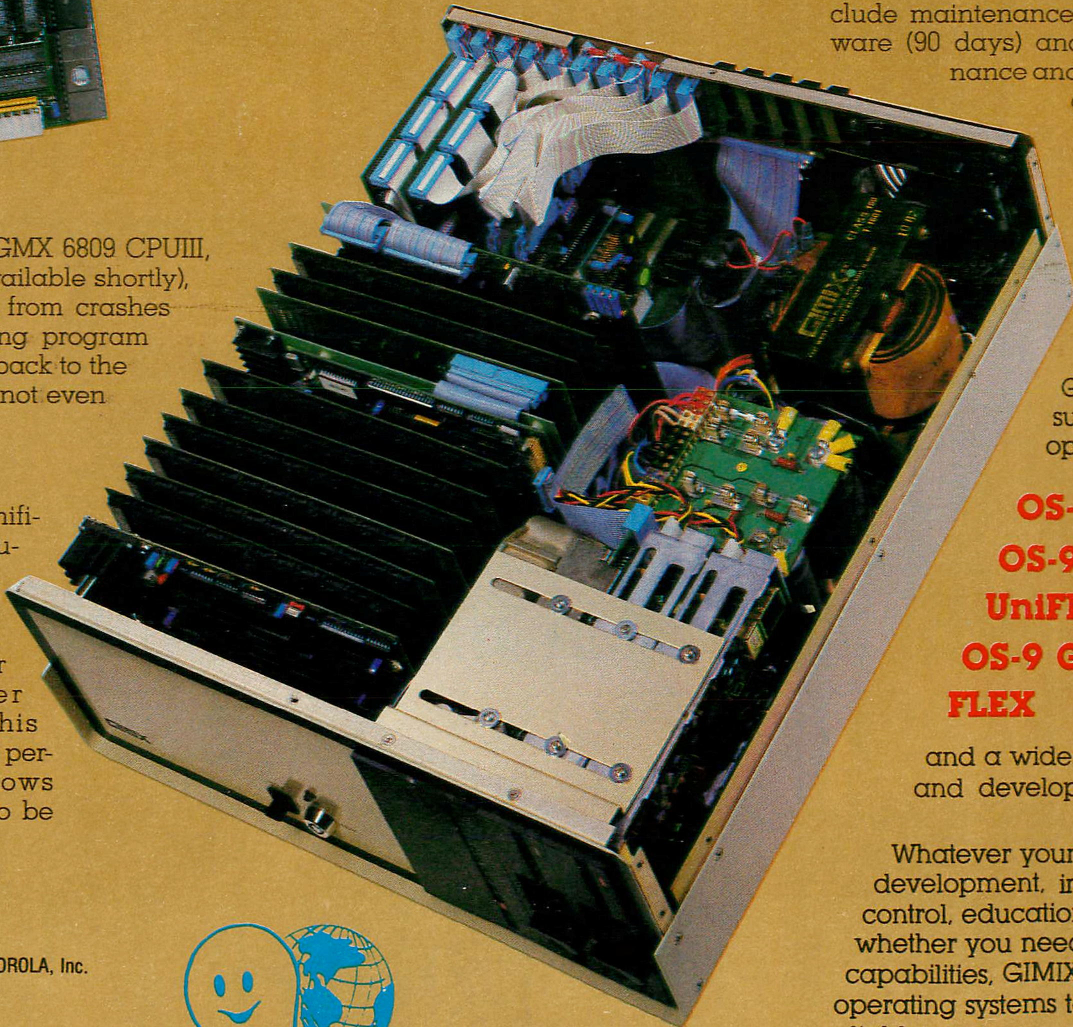

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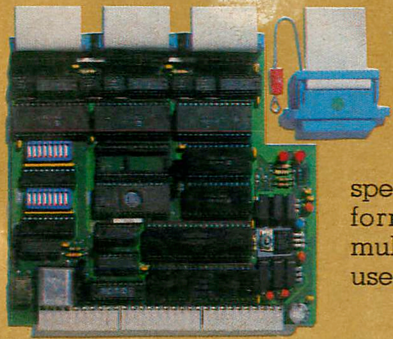

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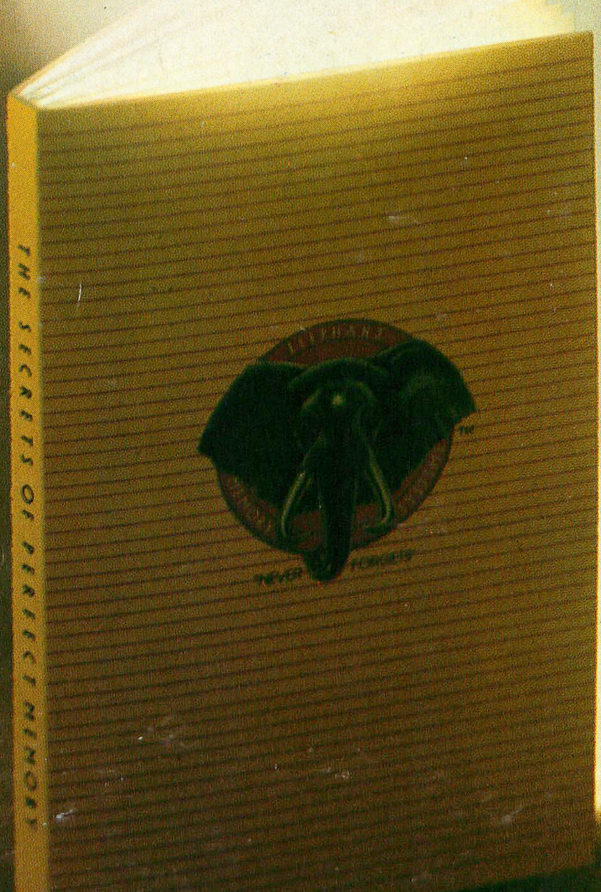

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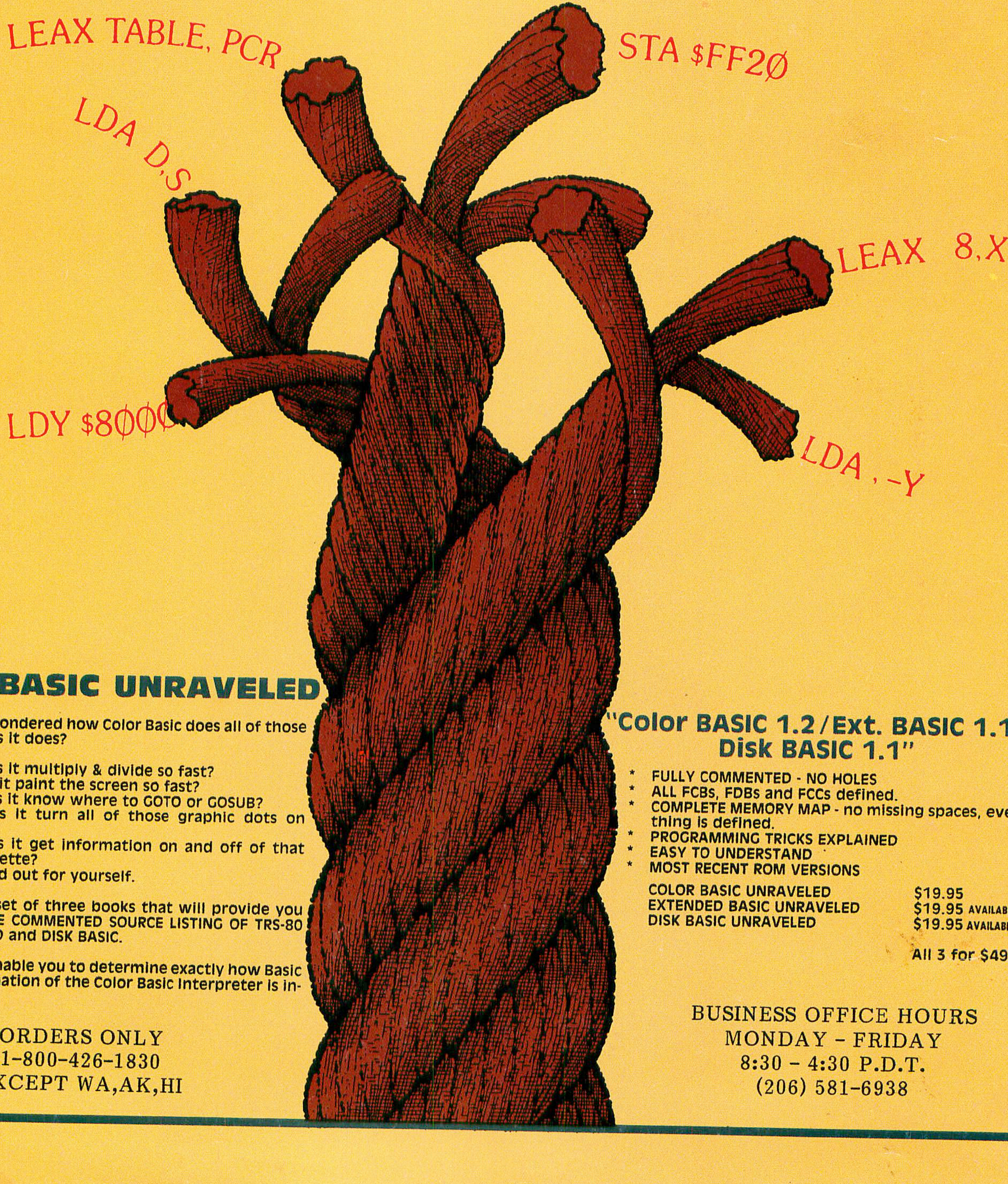

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